

NORTH CAROLINA STATE BUILDING
CODE--1980

VOLUME II, PLUMBING

N.C. Dept. of Insurance

C692.9
N87b3 v.2
1980
REV. 3
(MAR, 1987)

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Rev.3

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NORTH CAROLINA STATE BUILDING CODE 1980 VOLUME II, PLUMBING

REVISION 3

This revision represents changes to the North Carolina State Building Code, Volume II, Plumbing, 1980 Edition. These are the accumulative changes of the Code through March 10, 1987. It is requested that you follow checking slip below for revision 3.

Both Revision Nos. 1 and 2 are included to update 1980 Edition thru March, 10, 1987.

CHECKING SLIP

Replace or insert (check paragraph below) pages:

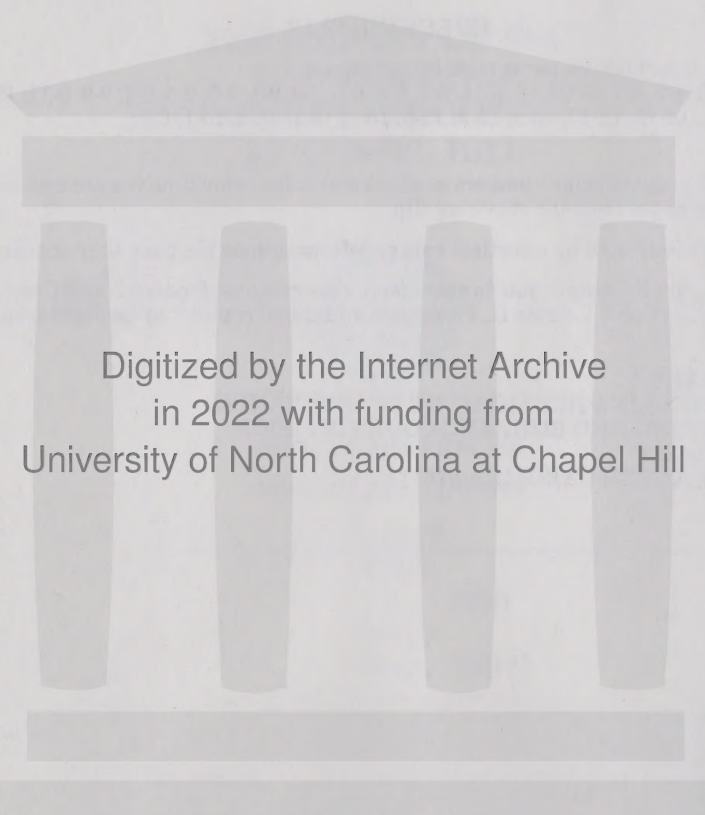
1-9, 4-1, 4-3, 4-5, 5-7, 5-9, 5-13, 5-15, 6-1, 6-3, 6-5, 7-3, 9-1, 9-3, 9-5, 9-7, 9-9, 9-11, 12-3, 12-7, 12-11, 12-15, 12-17, 13-1, 13-3, 13-5, 13-7, 14-1, 14-3, 15-1, C-3.

Remove old pages of same numbers as above and at the same time you are replacing or inserting pages from the checking slip.

Changes are indicated by a vertical rule on left margin on the page they appear.

If any pages are missing or you do not receive a complete set for each North Carolina State Building Code, Volume II, Plumbing, additional copies may be purchased by notifying:

**JACKIE BAKER
NORTH CAROLINA DEPARTMENT OF INSURANCE
ENGINEERING AND BUILDING CODES DIVISION
P. O. BOX 26387
RALEIGH, NORTH CAROLINA 27611**



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FOREWORD

North Carolina has been a pioneer in the field of Statewide Building and Fire Prevention regulations which have been enacted for the protection of the public. The Building Laws passed in 1903 and 1905 created a Building Code for materials and methods of construction in use at that time.

The General Assembly of 1933 created a Building Code Council and authorized it to, in cooperation with the Commissioner of Insurance, prepare and adopt a Building Code. The first North Carolina Building Code received the approval of the official Building Code Council and the Commissioner of Insurance in 1935 and was printed that same year. The General Assembly of 1941 ratified and adopted this edition, which was known as the 1936 Edition.

The 1936 Edition contained a State Plumbing Code. It was rewritten by the State Board of Health and the Building Code Council in 1954. The 1954 Edition was printed as Article XX of the State Code and it was bound in the 1958 Edition. The 1933 Building Code Council authorized cities and towns to make changes in the State Code as long as they were more stringent. However, many cities and towns and counties rewrote the State Code and some adopted a plumbing code of their own thus providing for different plumbing regulations in many areas of the State.

The 1957 Legislature rewrote the 1933 Building Code Council Act and re-organized and expanded the Council. All local Codes different from the State Code were required to be approved by the Council.

The technical provisions herein are taken from the 1962-1963 Edition of the Southern Standard Plumbing Code with 1964-66 Amendments published by the Southern Building Code Congress which is based mainly on the 1955 Edition of the National Plumbing Code, ASA, A40.8—1955.

The Code is presented with the hope that its use will protect the public from dangerous and unsanitary buildings and will provide Architects and Engineers a set of minimum standards to follow in designing buildings. The Building Code Council has authority to make changes in the Code when the wider use of materials and methods comply with standards set forth in the Laws. From time to time, there will be modifications and changes in the Code.

MEMBERS OF THE NORTH CAROLINA BUILDING CODE COUNCIL

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NORTH CAROLINA DEPARTMENT OF INSURANCE

By Statute the Commissioner of Insurance has general supervision of the administration and enforcement of the North Carolina Building Code and the Engineering Division serves as the staff for the Building Code Council. Officials of the Insurance Department are:

JAMES E. LONG
Commissioner

LEE HAUSER, P.E.
Deputy Commissioner and
Secretary to Council

with the Commissioner of Insurance or Department of Labor (whichever has jurisdiction) and with the local Inspection Department within a period of 10 days after the order, decision, or determination.

(c) The Commissioner of Insurance (or Department of Labor) shall appoint a time for the hearing of the appeal, giving the appellant and the local Inspection Department reasonable notice thereof. The Commissioner (or Department of Labor), through an appropriate official, shall conduct a full and complete hearing of the matters in controversy and make a determination thereof within a reasonable time thereafter. The person requesting the hearing and the local Inspection Department shall, upon request, be furnished a written statement of the decision, setting forth the facts found, the decision reached, and the reasons therefor. (Authority: G.S. 143-139, 143-140, 153A-374. 160A-434.)

(d) Appeals from the Commissioner of Insurance may be taken to the Building Code Council or to the Courts as provided by law. (Authority: G.S. 150A-43.)

106.3—APPEALS TO BUILDING CODE COUNCIL FROM DECISIONS OF STATE ENFORCEMENT AGENCIES

(a) Any person desiring to take an appeal to the Building Code Council from the decision of the State enforcement agency must file such an appeal within 30 days after such decision giving written notice to the Council.

(b) *Procedural Rules for Appeals from Decisions of Enforcement Agencies:*

Rule 1—Time of Notice—Any person wishing to appeal from the decision of an enforcement agency to the Building Code Council shall give a written Notice of Appeal as follows:

(a) The *original and twelve copies* of said notice shall be filed not later than 30 days from the date of the decision of the enforcement agency with the Building Code Council, c/o Division of Engineering, Department of Insurance, Box 26387, Raleigh, North Carolina.

(b) The staff of the Building Code Council shall immediately forward one copy of said notice to the enforcement agency from which the appeal is taken.

(c) The time within which notice is to be filed, shall be computed by excluding the first and including the last day. If the last day is Saturday, Sunday or a legal holiday, it must be excluded.

Route 2—Form of Notice—Whenever Notices of Appeal is given as provided by these rules, said notice shall be legibly printed, typewritten or mimeographed and shall contain the following information:

(a) The name of the party or parties taking the appeal;

(b) The name of the enforcement agency and the date of the decision from which the appeal is taken;

(c) The decision from which the appeal is taken must be set forth in full in the Notice of Appeal, or a copy of said decision must be attached to all copies of the Notice of Appeal;

(d) The contentions and allegations of fact of the party or parties taking the appeal must be set forth in full in a clear and concise manner with particular reference to the section or sections of the North Carolina State Building Code in controversy;

(e) The original notice shall be signed by the party or parties filing same. No notarization or verification is required;

(f) In order for the filing to be placed on the agenda for the Building Code Council and to be heard at any regular or called meeting, such filing shall be complete with information required by these rules, together with all substantiating data required and must be filed in accordance with these rules at least 30 days prior to such scheduled hearings.

Rule 3—Times for Hearing—Upon the proper filing of an appeal in accordance with these rules, the Chairman of the Building Code Council shall cause the appeal to be

Section 107

heard by the Council within a reasonable time, at least *ten day notice* to Council members.

Rule 4—Notice to Appellant—The Chairman of the Building Code Council shall cause all appeals to be docketed for hearing and shall fix the time and place for said hearing and shall cause not less than ten days notice in writing, of the time and place of the hearing on the appeal to be given to the appellant, the enforcement agency from which the appeal is taken and all members of the Council.

Rule 5—Dismissal—The Council shall, upon motion of the enforcement agency or on its own motion, dismiss all appeals for the following reasons:

- (a) Not prosecuted by the appellant.
- (b) All appeals wherein the Notice of Appeals has not been filed in accordance with these Rules.
- (c) For lack of jurisdiction. (Authority: G.S. 143-139, 143-140, 143-141, 153A-374, 160A-434.)

106.4—APPEALS TO COURT

By Statute a person may appeal directly to the Superior Court in Wake County or the county in which the building is to be situated with or without an appeal to the Building Code Council. (Authority: G.S. 143-140, 143-141(d), 153A-374, 160A-434.)

SECTION 107—AMENDMENTS TO STATE BUILDING CODE

107.1—AMENDMENTS—GENERAL

In considering and acting upon proposed amendments to this Code, the Building Code Council shall comply with the requirements of G.S. 143-138 and of Articles 2 and 5 of G.S. Chapter 150A (Administrative Procedure Act).

107.2—PROCEDURAL RULES FOR HEARINGS BEFORE THE BUILDING CODE COUNCIL ON PROPOSED AMENDMENTS TO THE NORTH CAROLINA STATE BUILDING CODE.

The following procedural rules shall apply when any citizen, State agency, or political subdivision of the State makes application to the Building Code Council requesting that the North Carolina State Building Code be revised or amended pursuant to G.S. 143-138(d):

Rule 1—Request for Hearing—Any citizen, State agency, or political subdivision of the state requesting a hearing before the Building Code Council for the above purposes shall submit a written request as follows:

(a) An *original and 14 copies* of said request for hearing shall be filed with the Building Code Council, c/o Division of Engineering, Department of Insurance, Box 26387, Raleigh, North Carolina. In order for the filing to be placed on the agenda for the Building Code Council and to be heard at any regular or called meeting, such filing shall be complete with information required by these rules, together with all substantiating data required and must be filed in accordance with these rules at least 35 calendar days prior to such scheduled hearings.

(b) The staff of the Building Code Council shall immediately forward one copy of said request to each member of the Building Code Council.

Rule 2—Form of Request for Hearing—Each request shall be legibly printed, typewritten, or mimeographed and shall contain the following information:

- (a) Name, address and basis of interest of party or parties requesting hearing.
- (b) The proposed amendment to the North Carolina State Building Code must be set forth in full, and the request shall contain explicit reference to the affected section or sections of the Building Code.
- (c) The request shall state, in support of the proposed amendment or amendments, the reasons for proposing the amendment or amendments.

CHAPTER IV

GENERAL REGULATIONS

401 Conformance with Code.

401.1

All plumbing systems hereafter installed shall conform at least with the provisions of this Code.

All materials shall be installed according to the manufacturer's recommendations where not in conflict with this Code. All pipe and fittings shall bear the manufacturer's name or trade mark.

401.2

All tank type water closets shall be of the water conserving type. Maximum storage and/or flow capacity shall be as required in Section 907.2."

401.3

All shower heads shall be of the water-conserving type. Maximum flow rate shall be as required in Section 911.6.

402 Grade of Horizontal Drainage Piping.

402.1

Horizontal drainage piping shall be run in practical alignment at a uniform grade. (See Chapter XIII for specific slopes.)

403 Change in Direction.

403.1 Fittings

Changes in direction in drainage piping shall be made by the appropriate use of 45-degree wyes, long-or-short-sweep quarter bends, sixth, eighth, or sixteenth bends, or by a combination of these or equivalent fittings. Single and double sanitary tees and quarter bends may be used in drainage lines only where the direction of flow is from the horizontal to the vertical except that a quarter bend may be used as an integral part of a water closet bend.

403.2 Short Sweeps.

Short sweeps not less than 3 inches in diameter may be used in soil and waste lines where the change in direction of flow is from either the horizontal to the vertical or from the vertical to the horizontal, and may be used for making necessary offsets between the ceiling and the next floor above.

404 Fittings and Connections.

404.1 Fittings Prohibited.

No fittings having a hub in the direction opposite to flow, or tee branch shall be used as a drainage fitting. No running threads, or saddles shall be used in the drainage system. No drainage or vent piping shall be drilled or tapped.

Section 405

404.2 Heel or Side Inlet Bend.

A heel or side-inlet quarter bend shall not be used as a vent when the inlet is placed in a horizontal position.

The heel and side inlet connections on a quarter bend, located directly below a water closet, may be used as a vent when located in the horizontal position if the inlets are washed by a fixture.

404.3 Obstruction to Flow.

No fitting or connection which offers abnormal obstruction to flow shall be permitted. See par. 607.

405 Repairs and Alterations.

405.1 Existing Buildings.

In existing buildings or premises in which plumbing installations are to be altered, repaired, or renovated, necessary deviations from the provision of this Code may be permitted, provided such deviations conform to the intent of the Code and are approved in writing by the Plumbing Official.

405.2 Health or Safety.

Wherever compliance with all the provisions of this Code fails to eliminate or alleviate a nuisance which may involve health or safety hazards, the owner or his agent shall install such additional plumbing or drainage equipment as may be necessary to abate such nuisance.

406 Sewer and Water Pipes.

406.1

Water service pipes, or any underground water pipes, shall not be run or laid in the same trench as the building sewer or drainage piping, except as provided for in Chapters XII and XIII.

407 Trenching, Excavation, and Backfill.

407.1 Support of Piping.

Buried piping shall be supported throughout its entire length.

407.2 Tunneling and Driving.

Tunneling may be done in yards, courts, or driveways of any building site. When pipes are driven, the drive pipe shall be at least one size larger than the pipe to be laid.

407.3 Open Trenches.

All excavations required to be made for the installation of a building-drainage system, or any part thereof within the walls of a building, shall be open trench work and shall be kept open until the piping has been inspected, tested, and accepted.

407.4 Mechanical Excavation.

When mechanical means of excavation are used, ditch shall be properly graded and tamped to support the load of the pipe installation.

407.5 Backfilling.

Adequate precaution shall be taken to insure proper compactness of backfill around piping without damage to such piping.

407.6 Backfill Material.

Trenches shall be backfilled in thin layers to 12 in. above the top of the piping with clean earth which shall not contain stones, boulders, cinder-fill, or other materials which would damage or break the piping or cause corrosive action. Mechanical devices such as bulldozers, graders, etc., may then be used to complete backfill to grade. Fill shall be properly compacted.

408 Structural Safety.**408.1**

In the process of installing or repairing any part of a plumbing and drainage installation, the finished floors, walls, ceilings, tile work, or any other part of the building or premises which must be changed or replaced shall be left in a safe structural condition in accordance with the Requirements of the Building Code or as approved by the Plumbing or Building Official.

409 Workmanship.**409.1**

Workmanship shall conform to generally accepted good practice.

410 Protection of Pipes.**410.1 Breakage and Corrosion.**

Pipes passing under or through walls shall be protected from breakage. Pipes passing through or under cinder or concrete or other corrosive material shall be protected against external corrosion by protective coating, wapping, or other means which will prevent such corrosion.

410.2 Cutting or Notching.

No structural member shall be weakened or impaired by cutting, notching, or otherwise, except to the extent permitted by the Plumbing or Building Official.

410.3 Pipes Through Footings or Foundation Walls.

A soil or waste pipe, or building drain passing under a footing or through a foundation wall shall be provided with a relieving arch; or there shall be built into the masonry wall an iron pipe sleeve two pipe sizes greater than the pipe passing through or as may be approved in writing by the Plumbing Official.

410.4 Freezing.

The top of sewer or waste pipes, installed below grade outside the building, shall be below the frost line or a minimum of 12 inches below finished grade whichever is greater. Sewer, waste and water pipes installed in a wall exposed to the exterior or an unconditioned space shall be located on the heated side of the wall insulation. Water piping installed in an unconditioned attic or unconditioned utility room shall be insulated with 2" minimum thick insulation having a maximum K factor of 0.27.

Section 412

Note: These provisions are minimum requirements which have been found suitable for normal weather conditions. Abnormally low temperatures for extended periods may require additional provisions to prevent freezing.

411 Damage to Drainage System or Public Sewer.

411.1

It shall be unlawful for any person to deposit by any means into the building drainage system or into a public or private sewer any ashes; cinders; rags; inflammable, poisonous, or explosive liquids; gasses; oils; grease; or any other material which would or could obstruct, damage, or overload such system or sewer.

412 Industrial Wastes.

412.1

Wastes detrimental to the public sewer system or detrimental to the functioning of the sewage-treatment plant shall be treated and disposed of as directed by the Plumbing Official or other authority having jurisdiction.

413 Sleeves.

413.1

Annual space between sleeves and pipes shall be filled or tightly caulked with coal tar or asphaltum compound, lead, or other material found equally effective and approved as such by the Plumbing Official.

414 Ratproofing.

414.1 Exterior Openings.

All exterior openings provided for the passage of piping shall be properly sealed with snug fitting collars of metal or other approved ratproof material securely fastened into place.

414.2 Interior Openings.

Interior openings through walls, floors, and ceilings shall be ratproofed as found necessary by the Plumbing Official.

415 Used or Second-Hand Equipment.

415.1

It shall be unlawful to purchase, sell, or install used equipment or material for plumbing installations unless it complies with the minimum standards set forth in this Code.

416 Condemned Equipment.

416.1

Any plumbing equipment condemned by the Plumbing Official because of wear, damage, defects, or sanitary hazards shall not be re-used for plumbing purposes.

417 Depth of Building Sewer and Water Service (Outside of Building).

418 Piping in Relation to Footings.

418.1 Parallel.

No piping shall be laid parallel to footings or outside bearing walls closer than 3 feet, except as may be approved by the Plumbing Official.

418.2 Depth.

Piping installed deeper than the bottom of footings or bearing walls shall be 45 deg. therefrom except as may be approved by the Plumbing Official.

419 Drainage Below Sewer Level.

419.1

Drainage piping located below the level of the sewer shall be installed as provided for in Chapters XIII and XV.

420 Connections to Plumbing System Required.

420.1

All plumbing fixtures, drains, appurtenances, and appliances used to receive or discharge liquid wastes or sewage shall be connected properly to the drainage system of the building or premises, in accordance with the requirements of this Code.

421 Sewer Required.

421.1

Every building in which plumbing fixtures are installed shall have a connection to a public or private sewer except as provided in paragraph 422.1.

422 Individual or Private Sewage-Disposal System.

422.1

When a public sewer is not available within 300 feet for use, sewage and drainage piping shall be connected to an individual sewage-disposal system found to be adequate and approved by the Board of Health or extend to the public sewer.

423 Location of Fixtures.

423.1 Light and Ventilation.

a. All bathrooms containing more than one flushing type fixture shall be provided with windows of not less than three (3) sq. ft. area to provide a minimum of at least two (2) cubic feet of fresh air per minute per square foot of floor, area, or provided with a system of mechanical or gravity ventilation capable of exhausting forty (40) cubic feet of air per minute per water closet or urinal in public bath or rest rooms and not less than twenty-five (25) cubic feet per minute in private bath rooms, but in no case shall the fresh air supply be less than specified above.

b. Public bath, toilet or rest room shall not open directly into a kitchen or room used for the preparation of food (see definition of public).

Section 423

423.2 Improper Location.

Piping, fixtures, or equipment shall not be located in such a manner as to interfere with the normal operation of windows, doors, or other exit openings.

424 Piping Measurements.

424.1

Except where otherwise specified in this Code all measurements between pipes or between pipes and walls, etc., shall be made to the center lines of the pipes.

425 Venting.

425.1.

The drainage system shall be provided with a system of vent piping which will permit the admission or emission of air so that under no circumstances of normal or intended use shall the seal of any fixture trap be subjected to a pressure differential of more than 1 inch of water.

426 Ventilation Ducts.

426.1

Ventilation ducts from washrooms and toilet rooms shall exhaust to the outer air.

427 Water Closet Connections.

427.1 Lead.

Three-inch lead bends and studs may be used on water closets or similar connections, provided the inlet is dressed or swedged to receive a 4-inch floor flange.

427.2 Iron.

Three-inch bends may be used on water closets or similar connections, provided a 4-inch by 3-inch flange is used to receive the fixture horn.

427.3 Reducing.

Four-by-three-inch reducing bends are acceptable.

428 Dead Ends.

428.1

In the installation or removal of any part of a drainage system, dead ends shall be avoided except where necessary to extend a cleanout so as to be accessible.

MATERIALS	SEE SECTIONS 501.3 & 504.2			OTHER STANDARDS & REMARKS
	ANSI	ASTM	FS	
Concrete Reinforced Culverts		C-76-72		CS-228-61. See Section 506
Concrete Perforated		C-44-68		
Concrete Drain Tile		C-412-72		
Plastic Pipe & Fittings			WW-P-00380	
SRP—Pipe & Fittings				
For Interior DWV, Indirect Waste, Sanitary Sewers and Interior Storm Water Systems:				
abs-DWV Pipe Sch. 40	B72-18.71	D-2661-73	LP-322a	CS-270-65 & NSF Seal of Approval *See Sections 504.2 and 1302.1
abs-DWV Fittings	B72-18.71	D-2661-73	LP-322a	CS-270-65 & NSF Seal of Approval *See Sections 504.2 and 1302.1
abs-DWV Solvent Cement	B72-23-71	D-2235-73		NSF Seal of Approval
PVC-DWV Pipe Sch. 40		D-2665-73	LP-320a	CS-272-65 5 NSF Seal of Approval *See Sections 504.2 and 1302.1
PVC-DWV-Fittings		D-2665-73	LP-320a	CS-272-65 5 NSF Seal of Approval
PVC-DWV-Solvent Cement	B72.16-71	D-2564-72		*See Sections 504.2 & 1302.1
ABS-Foam Core		F628-79		NSF Seal of Approval

MATERIALS		SEE SECTIONS 501.3 & 504.2			OTHER STANDARDS & REMARKS
		ANSI	ASTM	FS	
For Outside Building Sewers, Storm Devices and Storm Sewers*					
ABS Sewer Pipe & Fittings		D2751-73		Installations Standards ASTM 2321-74** and page 5-15	
Type PSP PVC Sewer Pipe and Fittings		D3033-73		Installations Standards ASTM 2321-74** and page 5-15	
Type PSM PVC Sewer Pipe and Fittings		D3034-73		Installations Standards ASTM 2321-74** and page 5-15	
For Exterior Storm Water, Area Drains, Subsoil Drainage and Septic Tank Fields					
ABS Sewer Pipe & Fittings		D-2751-71		NSF Std 14	
ABS Solvent Cement		D-2235-67		NSF Seal Approval	
PVC Sewer Pipe & Fittings		D-2729-68		NSF Std 14	
Solvent cement		D-2564-67		NSF Seal Approval	
Joints for Plastics Pipe and Fittings Using Flexible Elastomeric Joints					
Pressure Joints		D3139-73		See Section 602.19	
Non-Pressure Joints for Drain		D3212-73T		See Section 602.19	

* D2661 and D2665 Sch. 40 ABS-PVC—F628 Foam Core may also be used for this purpose if so desired.

** Class III, IV and V soils require engineered systems which are designed and supervised by a licensed architect or licensed engineer to be in compliance with ASTM 2321-74. Non-engineered use of this pipe is restricted to native soils of Class I or Class II materials (Granular sands and gravel materials) for bedding 6 inches beneath the pipe, haunching and initial backfill of 6 to 12 inches above the pipe. For usage under Section 1302.1, 1501.5, 1502.4, and 1502.5

MATERIALS		SEE SECTIONS 501.3 & 504.2			OTHER STANDARDS & REMARKS
		ANSI	ASTM	FS	
PLASTIC PIPE AND FITTINGS (Cont.)					
For Exterior Water Service Piping—Lawn Sprinkler Systems					
Plastic Pipe and Fittings Pressure Rated					
abs-Pipe	1208	*			CS 281-59
Acrylonitrile	1210	B72.3-67	D-1527-73		CS 254-63 and the NSF Seal of Approval
Butadiene	2112	B72.3-71	D-2282-71		*See Section 506.6
Styrene	1316				NSF Seal of Approval
Fittings			D-2468-68		NSF Seal of Approval
Solvent Cement		B72.23-71	D-2235-72		NSF Seal of Approval
PB-Pipe (*2110)		B72.19-71	D-2662-68		NSF Seal of Approval
Polybutylene					*See Section 506.6
Tubing (2110)*			D-2666-67T		NSF Seal of Approval
PE-Pipe	2305	B72.1-67	D-2104-71	LP-00315b	CS 197-60
Polyethylene	2306		D-2239-71a		CS 255-63 and the NSF Seal of Approval
& Tubing	3206		D-2737-74		*See Section 506.6
	3306				NSF Seal of Approval
Fittings (Insert)	3406	B16.27-62	D-2609-74		NSF Seal of Approval
PVC-Pipe	*				CS 207-60
Polyvinyl Chloride	1120	B72.2-67	D-1785-69	LP-1036	CS 256-63 & NSF Seal of Approval *See Sect. 506.6
	1220		D-2241-72		NSF Seal of Approval
Fittings			D-2467-67		NSF Seal of Approval
Solvent Cement		B72.16-71	D2564-67		
For Interior Hot and Cold Water Distribution Piping					
Chloride Pipe and Fittings (CPVC)					
			D-2846-73		NSF Seal of Approval
					Appendix A-2 of ASTM-2846-73 and manufacturer's recommendations

MATERIALS	SEE SECTIONS 501.3 & 504.2			OTHER STANDARDS & REMARKS
	ANSI	ASTM	FS	
Polybutylene (PB2110) Pipe, Tubing & Fittings		D-3309		NSF Seal of Approval and Appendix C of this code.
Plastic Materials				
Acetals		D-2133-64T	LP-392a(64)	
Acrylics		D-788-63	LM-500(60)	
Fluorocarbon		D-1457-62T	LP-403(64)	See Section 506
Nylon		D-789-62T		
Ferrous Pipe & Fittings				
Cast Iron Soil Pipe & Fittings—Service Weight				CS-188-59 and Amd.
Cast Iron Soil Pipe & Fittings—Extra Heavy	-40-1.35	A-74-69	WW-P-401(51)	CS-188-59 and Amd. 1
Cast Iron Water Pipe	A-21.2-53	A-377-72	WW-P-421b(61)	AWW A-C 100-55
Cast Iron Pipe (threaded)	A-40.5-43		WW-P-356(36)	
Cast Iron Fittings (threaded)	B-16.4-63	A-126-71	WW-P-501c(56)	
Cast Iron Drainage Fittings (threaded)	B-16.12-65	A-126-71	WW-P-491a(46)	
Wrought Iron Pipe	B-36.2-61	A-72-68	WW-P-441b(52)	
Wrought Steel Iron Pipe	B-36.10-59			
Steel Pipe Black & Hot-Dipped Zinc-Coated (Galvanized) for ordinary use	B-36.20-66	A-120-72	WW-P-406b(1)(64)	

MATERIALS	SEE SECTIONS 501.3 & 504.2			OTHER STANDARDS & REMARKS
	ANSI	ASTM	FS	
MISCELLANEOUS (Cont.)				
Coal-Tar Enamel (Protective Coating)			HH-C-536c(54)	AWWA-C-203-62
Fixture-Setting Compound			564-65T	
Neoprene Elastomeric Compression Joint Sealer (Gasket)				Composition
Borosilicate Glass Pipe and Fittings (Acid Waste Only)				DD-6-541A MIL-P-22561A
Air Gap Standards	A112.1.2-42			
Valves Bronze Gate			WW-V-54c(66)	
Valves Cast Iron Gate		A-126-71	WW-V-58a(66)	
Gas Water Heaters (75,000 BTU & Less (above 75,000 BTU))	Z-21.10.1-71 Z-21.10.3-71			AGA-Approved
Pressure & Temperature Relief Valves	Z-21.22-71			ASME, AGA & NBBVI approved
Vacuum Relief Valves	Z-21.22-71			

Section 505

504.2 Limited Use of Materials

ABS-DWV and PVC-DWV Schedule 40 pipe and fittings, conforming to Table 505, may be used for Plumbing Drainage, Waste and Vents, indirect wastes, and interior storm water systems, in buildings in which the top occupied floor does not exceed seventy-five (75) feet in height.

All installations shall conform to installation instructions of the Plastic Pipe Institute and/or the respective manufacturer.

There shall be no co-mingling of the two materials within a system and where necessary co-mingling shall be done only through the use of proper adapters. All cements shall conform to the standards listed in Table 505. Combination or aerosol cements shall not be used. (see section 602.19)

Note 1:

Asbestos cement building sewer pipe shall conform to ASTM standard C-428-65T or Federal specification SS-P-331b (1965) with the following amendment:

Diameter: Pipe shall be supplied in nominal diameters of 4, 5 and 6 inch.

Class: Building sewer pipe shall be available in two strength classifications designated as class 1500 and class 2400.

Lengths: Pipe shall be supplied in standard lengths of 10 or 13 foot with $\frac{1}{2}$ lengths 5 foot and 6 foot 6 inch respectively, available on request.

Out of roundness: Shall be measured inside the end of length at a point equal to $\frac{1}{2}$ the coupling length and shall not exceed plus or minus $\frac{3}{16}$ of one inch.

Hydrostatic strength: not applicable

Flexural strength:

	Class 1500	Class 2400
4"	550 lbs.	725 lbs.
5"	950 lbs.	1230 lbs.
6"	1500 lbs.	1850 lbs.

Each standard length shall be tested in flexure on a 9 foot span using the above total applied load. When supplying 13 foot lengths the manufacturer may test on a 12 foot span using $\frac{9}{12}$ of the load specified in the above table.

Crushing strength:

	Class 1500	Class 2400
4"	1500 lbs.	2400 lbs.
5"	1500 lbs.	2400 lbs.
6"	1500 lbs.	2400 lbs.

Each pipe when tested shall have sufficient crushing strength to withstand the above load when tested by the ASTM Three Bearing Test Method.

Note 2:

Modified Epoxy Resin Pipe and Fittings.

(Acid Wastes Only)

Tensile Strength (ASTM Method D651-48) 12,700 PSI

Comprehensive Strength (ASTM Method D790-54) 38,000 PSI

Flexural Strength (ASTM Method D790-49T) 19,300 PSI

Crushing Strength $1\frac{1}{2}$ " nominal diameter 13,368 lb. lin. ft.

**ENGINEERING AND BUILDING CODES DIVISION
RECOMMENDATION ON THE ADMINISTRATIVE PROCEDURES ON THE
ENFORCEMENT OF INSTALLATION PROCEDURES REQUIRED FOR
ASTM D2751, D3033, and D3034—FLEXIBLE THERMOPLASTIC SEWER PIPE**

The installation procedures for this pipe require special precautions to make sure the soil surrounding the pipe imparts equal pressure around the circumference of the pipe which is critical for this pipe but not for the thicker wall plastic pipe and other types of sewer pipe, and for this reason the Engineering Division and several members of the Building Code Council stated that the Division should issue Administrative Recommendations to assist in enforcement which must be assured for proper performance of the pipe in various soils.

The Engineering Division recommends that local inspectors issue permits on the use of this pipe under the following conditions in order to assure more reliability of placing the responsibility of the required installation procedures on the designers and installers or inspectors whichever permit method is used.

(1) **Permits for Engineered Design Systems Certified by Engineer**—Permits should be used for these systems in any class of soil permitted by ASTM 2321 where the licensed architect or licensed engineer will file a certificate with the inspection department that he is familiar with ASTM 2321-74. (Installation Standards for Flexible Thermoplastic Sewer Pipe and Fittings) when the permit is issued and will file a certificate that the pipe has been installed in accordance with ASTM 2321-74 Installation Standards for Thermoplastic Sewer Pipe and Fittings after the installation has been made.

(2) **Permit for Non-Engineered Systems Certified by Installer**—Permits should be issued to the installer if the installer certifies that he is familiar with 2321-74 and that he will install Class I or Class II material (Granular sands and gravel materials) as bedding, haunching and initial backfill at the time the permit is issued and will file a certificate with the inspector, after the installation, that he has installed the ASTM 2751, D3033 and D3034, Flexible Thermoplastic Sewer Pipe and Fittings with Class I and Class II material (Granular sands and gravel materials) as bedding 6" underneath the pipe, Haunching and initial backfill of 6 to 12 inches above the pipe. In instances where the local inspector is not assured by the installer that Class I and Class II (Granular sands and gravel material) materials will be used, he may require certification by a licensed engineer or architect that the pipe has been installed in conformance with ASTM 2321-74.

(3) **Permits for Non-Engineered Systems More Closely Inspected by the Inspection Department**—Permits should be issued to installers of flexible thermoplastic sewer pipe in soils where the inspector has determined that the native soil is Class I or II materials (Granular sands and gravel materials). In cases he is assured by the installer that the installer will haul in Class I and II materials (Granular sands and gravel materials) for bedding 6 inches underneath the piping, haunching and initial backfill of 6 to 12 inches above the pipe and the inspection department has sufficient personnel to inspect the installations at the time the hauled in material is being placed, permit should be issued to such installers.

(4) **Other Permit Methods**—In addition to the above, methods of issuing permits any inspector who feels that he is sufficiently knowledgeable and experienced in soil identification, he may issue permits under any other system which will assure the owner that the pipe is installed in conformance with ASTM D2321-74.

Section 506

506 Limitation of use of Materials Listed in Table 505.

506.1 Asbestos Cement Sewer Pipe.

For uses see Sections 602.11, 1302.1, 1501.5, 1502.4 and 1502.5.

506.2 Bitumized Sewer Pipe and Fittings.

For uses see Sections 602.11, 1302.1, 1501.5, 1502.4 and 1502.5.

506.3 SRP—Plastic Pipe and Fittings.

For storm sewers, storm drain pipe and fittings out side the building see Sections 1501.5 and 1502.5.

506.4 Plastic Materials.

For uses see Sections 502, 703, 704, 909 and Table under Note 4 of Section 501.3.

506.5 DWV—Copper Drainage Tube.

For above ground drainage waste and vents "Except urinal waste and vents."

506.6 Plastic Pipe and Fittings Pressure Rated For Water Service Pipe—

- (a) In Table 505 these numbers are listed under "Materials" column which represents the ASTM designation numbers assigned to those materials by the joint ASTM-NSF-PPI committee to assist in quick, easy identification of the materials. The numbers appear as a part of the marking on the pipe and/or tubing. These and no others are approved.
- (b) All plastic pipe and fittings approved in Table 505 shall be properly marked as specified by their respective standards. All material shall be installed as recommended by the manufacturer and/or the Plastics Pipe Institute. All water service piping shall have a minimum working pressure of 160 psi, with permanent identification markings.
- (c) No existing metallic water service piping used for electrical grounding shall be replaced with non-metallic pipe or tubing until other grounding means are provided which are satisfactory to the proper administrative authority having jurisdiction.
- (d) "Polybutylene piping per ASTM D3309 marked for 100 psi pressure at 180°F may be substituted for D2662, D2666, or other piping in water supply lines from supply source to residential interior systems."

NOTE: Section 2501 (a) and (c) of Volume I states that no combustible materials shall enter into construction of wall, floor and roof assemblies unless such assemblies have been tested in accordance with ASTM-E-119 where the code requires such assemblies to have an hourly fire resistance rating.

507—Used Plumbing Fixtures, Piping, Equipment, and Accessories.

Before installation all used plumbing fixtures, piping, equipment and accessories shall be inspected and approved by the Plumbing Inspector.

CHAPTER VI

JOINTS AND CONNECTIONS

601 Tightness.

601.1

Joints and connections in the plumbing system shall be gastight and watertight for the pressure required by test, with the exceptions of those portions of perforated or open-joint piping which are installed for the purpose of collecting and conveying ground or seepage water to the underground storm drains.

602 Types of Joints.

602.1 Calked Joints.

Calked joints for cast-iron bell-and-spigot soil pipe shall be firmly packed with oakum or hemp and filled with molten lead not less than 1-inch deep and not to extend more than 1/8-inch below rim of hub. No paint, varnish, or other coatings shall be permitted on the jointing material until after the joint has been tested and approved.

602.2 Threaded Joints, Screwed Joints.

Threaded joints shall conform to American National Taper Pipe thread, ASA B2.1-1945 or FS GGG-P-351a. All burrs shall be removed. Pipe ends shall be reamed or filed out to size of bore, and all chips shall be removed. Pipe-joint cement and paint shall be used only on male threads.

602.3 Wiped Joints.

Joints in lead pipe or fittings, or between lead pipe or fittings and brass or copper pipe, ferrules, solder nipples, or traps, shall be full-wiped joints. Wiped joints shall have an exposed surface on each side of a joint not less than 3/4-inch and at least as thick as the material being jointed. Wall or floor flange lead-wiped joints shall be made by using a lead ring or flange placed behind the joints at wall or floor. Joints between lead pipe and cast iron, steel, or wrought iron shall be made by means of a calking ferrule, soldering nipple, or bushing.

602.4 Soldered Joints.

Joints in copper or stainless steel water tubing shall be made by the appropriate use of brass or wrought copper water fittings, properly soldered together. The tube shall be measured correctly and cut square. All tube ends shall be fully reamed. Tube ends and fitting cups shall be cleaned by mechanical means and a non-corrosive, paste-type flux shall be sparingly applied to both tube ends and solder cups as soon as practicable. Excess flux shall be removed prior to heating. Sufficient heat shall be applied to the cup of the fitting to draw the solder into the joint by capillary attraction. The joint shall be allowed to cool naturally.

Solder and flux used for joints in piping systems containing potable water shall have a maximum lead content of 0.2 of 1%. (95% tin - 5% antimony solder).

602.5 Flared Joints.

Flared joints for soft tempered copper water tube shall be made with fittings meeting approved standards. The tubing shall be expanded with a proper flaring tool.

Section 602

602.6 Hot-Poured Joints.

Hot-poured compound for clay or concrete sewer pipe shall not be water absorbent and when poured against a dry surface shall have a bond of not less than 100 psi. All surfaces of the joint shall be cleaned and dried before pouring. If wet surfaces are unavoidable, a suitable primer shall be applied. Compound shall not soften sufficiently to destroy the effectiveness of the joint when subjected to a temperature of 160 deg. F nor be soluble in any of the waste carried by the drainage system. Approximately 25 per cent of the joint space at the base of the socket shall be filled with jute or hemp. A pouring collar, rope or other device shall be used to hold the hot compound during pouring. Each joint shall be poured in one operation until the joint is filled. Joints shall not be tested until one hour after pouring.

602.7 Precast Joints.

Precast collars shall be formed on the spigot and in the bell of the pipe in advance of use. Materials shall be resistant to both acids and alkalis, and precast joints shall conform in all respects to the requirements of ASTM Specifications, Designation C-425.

602.8 Brazed Joints.

All brazing shall be in accordance with the Copper Development Association Copper Tube Handbook.

602.9 Cement Mortar Joints.

Cement joints shall be used only when specifically permitted in other chapters of this Code or when approved by the Plumbing Official, as sufficient to accomplish the purpose of this Code. A layer of jute or hemp shall be inserted into the base of the joint space and rammed to prevent mortar from entering the interior of the pipe. Jute or hemp shall be dipped into a slurry suspension of portland cement in water prior to insertion into bell. Not more than 25 per cent of the joint space shall be used for jute or hemp. The remaining space shall be filled in one continuous operation with a thoroughly mixed mortar composed of one part cement and two parts sand, with only sufficient water to make the mixture workable by hand. After one-half hour of setting, the joint shall be rammed around entire periphery with a blunt tool to force the partially stiffened mortar into the joint and to repair any cracks formed during the initial setting period. Pipe interior shall be swabbed to remove any material that might have fallen into the interior. Additional mortar of the same composition shall be trowled so as to form a 45 deg. taper with the barrel of the pipe.

602.10 Burned Lead Joints.

Burned (welded) lead joints shall be lapped and the lead shall be fused together to form a uniform weld at least as thick as the lead being jointed.

602.11 Asbestos Cement Sewer Pipe Joints.

Joints in asbestos cement pipe shall be made with sleeve couplings of the same composition as the pipe, sealed with rubber rings. Joints between asbestos-cement pipe and other approved pipe materials shall be made by means of an adapter coupling sealed with a rubber ring, an approved PVC joint sealer or calked as required in paragraph 602.1.

When necessary to cut a new taper or pipe end in the field, a tapering tool designed for this purpose shall be used.

602.12 Bituminized Fiber Joints.

Joints in bituminized fiber pipe shall be made with tapered type couplings of the same material as the pipe. Joints between bituminized fiber pipe and metal pipe shall be made by means of an adapter coupling calked as required in paragraph 602.1.

When necessary to cut a new taper or pipe end in the field, a tapering tool designed for this purpose shall be used.

602.13 Elastomeric Compression Gasket Joints for Cast Iron Soil Pipe

(a) A positive-seal one piece elastomeric compression type gasket may be used for joining hub and spigot cast iron soil pipe as an alternate for lead and oakum joints, which is made by inserting an approved gasket in the hub. The inside of the gasket is lubricated and the spigot end of the pipe is pushed into the gasket until seated, thus effecting a positive seal.

(b) Joint for hubless cast iron soil pipe and fittings shall be made with an approved elastomeric sealing sleeve and a corrosion-resistant clamping device.

602.14 High Silicon Iron Pipe Joints.

Series 300 stainless steel coupling or drawbend with intermediate sleeve and nonporous inner sealing sleeve of sintered polytetrafluorethylene, to be molded of a single and continually joined ring type sleeve; and stainless steel nuts and bolts to be used for joining high silicon iron waste pipe and fittings.

602.15 Borosilicate Glass Joints.

Joints in borosilicate glass waste systems, vents, etc., shall be made with a stainless steel compression coupling bead to bead, or other non-corrosive coupling as may be approved by the administrative authority. Band, bolt and nut shall be of 300 series stainless steel, the band to surround a sleeve made of acrylonitrile rubber, inside the rubber sleeve of fluorocarbon polymer. Only the liner is to come in contact with contents of pipe.

602.16 Borosilicate Glass Drainline Joints.

Glass to glass connections shall be made with a bolt compression type stainless steel (300 series) coupling with contoured Buna-N resilient compression ring and a fluorocarbon inner seal ring, or other non-corrosive coupling as may be approved by the administrative authority.

Joints between glass drainline and other types of piping material shall be made with adapters having a TFE seal and/or according to manufacturer's recommendations.

Calked joints shall be as provided in Section 602.1 or packed with acid resistant asbestos rope and calked with acid proof cement.

602.17 Joints for Modified Epoxy Resin Pipe

Series 300 stainless steel or drawbend with intermediate neoprene sleeve and nonporous inner sealing sleeve of sintered polytetrafluorethylene, similar to DuPont Teflon (R), to be molded of a single and continually joined ring type sleeve; and stainless steel nuts and bolts to be used for joining modified epoxy resin pipe and fittings.

Section 603

602.18—Joining Plastic Water Service Piping

Plastic pipe and fittings for water service piping may be of the insert type, solvent cemented, hot or cold flared or a pressure lock *(which includes an internal elastomeric seal and metal retainer clip)* fitting as recommended by the manufacturer and/or the Plastic Pipe Institute for the particular materials being used.

602.19—Joints for Plastics Pipe and Fittings

Joints for all types of Plastics Pipe and Fittings shall be made in strict accordance with the joining techniques recommended for the various materials.

In Solvent cementing, all joints shall be square cut, all pieces shall be seated to the bottom of the fitting socket. In no case shall stress be applied at the joint for offsetting the pipe. No combination or aerosol cements shall be used. All cements shall be that designated for the particular materials being used. All shall in all cases, bear the seal of approval of the NSF. All defective joints shall be removed and replaced.

Transition to other materials shall be through proper adaptor fittings only.

Plastics Pipe and Fittings for sewer and water pressure lines may also be jointed by use of elastomeric joints where the respective standards for the materials so specify. The joints shall comply with the standards listed in Table 505 for elastomeric joints.

602.20 MECHANICAL JOINTS

"Joints between different piping materials may be made with a mechanical joint of the compression or mechanical sealing type. Joints shall be installed in accordance with the manufacturer's instructions."

Flexible couplings may be used to join the plain ends of similar or dissimilar pipes. The flexible coupling shall consist of an approved elastomeric sleeve that is attached to the pipe with adjustable clamps made of series 300 stainless steel.

603 Use of Joints.

603.1 Clay Sewer Pipe.

Joints in vitrified clay pipe or between such pipe and metal pipe shall be made as provided in paragraphs 602.6 and 602.7.

603.2 Concrete Sewer Pipe.

Joints in concrete sewer pipe or between such pipe and metal pipe shall be made as in paragraphs 602.6 and 602.7.

603.3 Cast Iron Pipe.

Cast Iron Pipe Joints in cast iron pipe shall be either caulked, screwed, positive-seal elastomeric compression gasket or an approved elastomeric sealing sleeve and a corrosion-resistant clamping device as provided in Sections 602-1, and 602.13(a), and 602.13(b).

603.4 Screw Pipe to Cast-Iron.

Joints between wrought-iron, steel, brass, or copper pipe, and cast-iron pipe shall be either calked or threaded joints made as provided in paragraphs 602.1 and 602.2 or shall be made with approved adapter fittings.

603.5 Lead to Cast-Iron, Wrought-Iron or Steel.

Joints between lead and cast-iron, wrought-iron, or steel pipe shall be made by means of wiped joints to a calking ferrule, soldering nipple, or bushing as provided in paragraph 602.3.

603.6 Copper and Stainless Steel Water Tube

Joints in copper and stainless steel tube shall be made in accordance with the requirements in Section 602.4 for soldered joints, Section 602.5 for flared (compression) joints or Section 602.8 for brazed joints.

604 Special Joints.**604.1 Copper and Stainless Steel Tube to Screwed Pipe Joints.**

Joints from copper or stainless steel tubing to threaded pipe shall be made by the use of brass adapter fittings. The joint between the copper or stainless steel tube and fitting shall be properly soldered or brazed and the connection between the threaded pipe and the fitting shall be made with a standard pipe size screw joint.

604.2 Welding or Brazing.

Brazing or welding shall be performed in accordance with requirements of recognized published standards of practice and by licensed or otherwise qualified mechanics, except when it is determined by the Plumbing Official to be equivalent procedure for the purpose of this Code.

604.3 Slip Joints.

Slip joints may be used on exposed tubular traps on the trap seal and also the inlet and outlet side of the trap. Slip joints in water piping may be used on the exposed fixture supply only.

604.4 Expansion Joints.

Expansion joints must be accessible and may be used where necessary to provide for expansion and contraction of the pipes.

604.5 Ground Joint Connections.

Ground joint connections which allow adjustment of tubing but provide a rigid joint when made up shall not be considered as slip joints.

604.6 Mechanical Pipe Couplings and Fittings

Mechanical pipe couplings and fittings in accordance with (a) and (b) below may be used for roof or storm drains, cold domestic water pipe, fire protection standpipes, and chilled and condenser water piping in air conditioning systems.

- (a) Mechanical couplings shall be with housing fabricated in two or more parts of malleable iron castings, in accordance with Federal specifications QQ-I-666C, Grade II. Coupling gasket shall be molded synthetic rubber, per ASTM D-735-61, Grade No. R615BZ. Coupling bolts shall be oval neck track head type with hexagonal heavy nuts per ASTM A-183-60.
- (b) All pipe fittings used shall be fabricated of malleable iron castings in accordance with Federal Specifications QQ-I-666C, Grade II. Where malleable fitting pattern is not available, fittings fabricated from schedule 40 steel pipe or standard wall seamless welding fittings with grooved ends may be used.

604.7 Field Formed Tee Connections

As an alternative method for a branch, a collar may be drawn from copper tubing by drilling and then drawing out the tube surface to form a collar by use of an appropriate tool for this purpose. The height of the collar shall be no more than three times the thickness of the copper tube wall.

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The collar shall be perfectly round and the space between the inside surface of the collar and the outside surface of the joining branch tube shall conform to the spacing as provided when brazing fittings are used.

An appropriate tool designed for the purpose shall be used to notch the end of the joining branch tube and to form a shoulder or dimple that will set the proper penetration depth of the branch tube into the fitting.

The brazing shall be in accordance with Section 602.8 using BCu series filler metal.

605 Unions (Screwed).

605.1 Drainage System.

Unions may be used in the trap seal and on the inlet side of the trap. Unions shall have metal-to-metal seats.

605.2 Water-Supply System.

Unions in the water-supply system shall be metal-to-metal with ground seats.

606 Water Closet, Pedestal Urinal, and Trap Standard Service.

606.1

Fixture connections between drainage pipes and water closets, floor-outlet service sinks, pedestal urinals, and earthenware trap standards, shall be made by means of brass, approved plastic, wrought copper, wrought copper alloy, hard-lead, or iron flanges, calked, soldered, or screwed to the drainage pipe. The connection shall be bolted with an approved gasket or washer or setting compound between the earthenware and the connection. The floor flange shall be set on an approved firm base. The use of commercial putty or plaster is prohibited.

607 Prohibited Joints and Connections.

607.1 Drainage System.

Any fitting or connection which has an enlargement, chamber, or recess with a ledge, shoulder, or reduction of pipe area, that offers an obstruction to flow through the drain, is prohibited.

607.2

No fitting or connection that offers abnormal obstruction to flow, shall be used. The enlargement of a 3-inch closet bend or stub to 4-inches shall not be considered an obstruction.

608 Waterproofing of Openings.

608.1

Joints at the roof, around vent pipes, shall be made water-tight by the use of lead, copper, galvanized-iron, or other approved flashings or flashing material. Exterior-wall openings shall be made water-tight.

609 Increases and Reducers.

609.1

Where different sizes of pipes, or pipes and fittings are to be connected, the proper size increasers or reducers or reducing fittings shall be used between the two sizes.

704.2 Location.

Cleanouts shall not be more than 50-feet apart in horizontal drainage lines of 4-inch nominal diameter or less and not more than 100-feet apart for larger pipes. Line cleanouts which may be rodded both ways shall be used whenever possible. Cleanouts shall not be located in an underfloor plenum space.

704.3 Underground Drainage.

Cleanouts, when installed on an underground drain, shall be extended to or above the finished grade level directly above the place where the cleanout is installed; or may be extended to outside of the building and brought to grade as indicated above.

704.4 Change of Direction.

Cleanouts shall be installed at each change of direction of the building drain greater than 45 deg.

704.5 Concealed Piping.

Cleanouts on concealed piping shall be extended through and terminate flush with the finished wall or floor, or brought to grade. Pits or chases may be left in the wall or floor, provided they are of sufficient size to permit removal of the cleanout plug and proper cleaning of the system.

704.6 Base of Stacks.

A cleanout shall be provided at or near the foot of each vertical waste or soil stack. For buildings with a floor slab on fill or ground or with less than 18-inch crawl space under the floor the following will be acceptable in lieu of a cleanout at the base of the stack. The building drain may be extended to the outside of the building and terminated in an accessible cleanout or an accessible cleanout installed in the building drain not more than 5-feet outside the building wall.

704.7 Building Drain Junction.

There shall be a cleanout near the junction of the building drain and building sewer or a cleanout with "Y" branch inside the building wall.

704.8 Direction of Flow.

Every cleanout shall be installed so that the cleanout opens in a direction opposite to the flow of the drainage line or at right angle thereto.

704.9

Cleanout plugs shall not be used for the installation of fixtures or floor drains except where approved in writing by the Plumbing Official.

705 Size of Cleanouts.**705.1 Small Pipes.**

Cleanouts shall be of the same nominal size as the pipes up to 4-inches and not less than 4-inches for larger piping.

705.2 Large Pipes.

For underground piping over 10-inches, manholes shall be provided and located at each 90 deg. change in direction and at intervals of not more than 300-feet.

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705.3 Manhole Covers.

Metal covers shall be provided for manholes.

706 Cleanout Clearances.

706.1 Large Pipes.

Cleanouts on 3-inch or larger pipes shall be so installed that there is a clearance of not less than 18-inches for the purpose of rodding or as approved by Plumbing Official.

706.2 Small Pipes.

Cleanouts smaller than 3-inches shall be so installed that there is a 12-inch clearance for rodding or as approved by Plumbing Official.

706.3

Cement, plaster, or any other permanent finishing material shall not be placed over a cleanout plug or as approved by Plumbing Official.

706.4 Concealment.

Where it is necessary to conceal a cleanout plug, a covering plate or access door shall be provided which will permit ready access to the plug.

707 Cleanout Equivalent.

707.1

A single fixture and trap readily removable without disturbing concealed roughing work, may be accepted as a cleanout equivalent, if there is no more than two 90 deg. bends on the line to be rodded and the line size does not exceed 2" (inches).

CHAPTER IX

PLUMBING FIXTURES

901 General Requirements — Materials.

901.1 Quality of Fixtures.

Plumbing fixtures shall be constructed from approved materials, have smooth impervious surfaces, be free from defects and concealed fouling surfaces, and, except as permitted elsewhere in this Code, shall conform in quality and design to one of the following standards:

Vitreous China Plumbing Fixtures, ANSI A112.19.2

Enameled Cast-Iron Plumbing Fixtures, ANSI A112.19.1

Porcelain Enameled Formed Steel Plumbing Fixtures, NBS Products Standards PS 5-66

Stainless Steel Plumbing Fixtures (Designed for Residential Use), NBS Commercial Standard CS 243-62

Plumbing Fixtures (for) Land Use, Including Fixtures for Medical and Dental Facilities FS WW-P 541 b and Interim amendment 6-1963

GEL-Coated Glass-Fiber Reinforced Polyester Resin Bathtub Units—USAS Z124.1-74

GEL-Coated Glass-Fiber Reinforced Polyester Resin Shower Receptor and Shower Stall Units, USAS Z 124.2-67

Trim for Water-Closet Bowls, Tanks and Urinals, NBS Product Standard PS 6-66

Plumbing Fixtures, Fittings, Trim R 227-47

Lavatory and Sink Traps R 21-46

902 Alternate Materials.

902.1 Materials.

Sinks and special fixtures may be made of soapstone, borosilicate glass for cupsinks, chemical stoneware, or may be lined with lead, copper-base alloy, nickel-copper alloy, corrosion-resisting steel or other materials especially suited to the use for which the fixture is intended.

903 Overflows.

903.1 Design.

When any fixture is provided with an overflow, the waste shall be so arranged that the standing water in the fixture cannot rise in the overflow when the stopper is closed or remain in the overflow when the fixture is empty.

903.2 Connection.

The overflow pipe from a fixture shall be connected on the house or inlet side of the fixture trap, except that overflows of flush tanks may discharge

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into the water closets or urinals served by them, but it shall be unlawful to connect such overflows with any other part of the drainage system.

904 Installation.

904.1 Cleaning.

Plumbing fixtures shall be installed in a manner to afford easy access for cleaning. Where practical, all pipes from fixtures shall be run to the nearest wall.

904.2 Joints.

Where fixture comes in contact with wall and floors, the joint shall be watertight.

904.3 Securing Fixtures.

Floor-outlet fixtures shall be rigidly secured to floor and/or closet flange (flange to floor) by screws or bolts.

904.4 Wall-hung Bowls.

Wall-hung water-closet bowls shall be rigidly supported by a concealed metal supporting member so that no strain is transmitted to the closet connection.

904.5 Setting.

Fixtures shall be set level and in proper alignment with reference to adjacent walls. (See paragraph 606.1.)

905 Water-Supply Protection.

905.1 Supply Fittings.

The supply lines or fittings for every plumbing fixture shall be so installed as to prevent backflow. (See paragraph 1204.3.)

906 Prohibited Fixtures and Connections.

906.1 Fixtures.

Pan, valve, plunger, offset, washout, latrine, frostproof, and other water closets having an invisible seal or an unventilated space or having walls which are not thoroughly washed at each discharge, shall be prohibited. Any water closet which might permit siphonage of the contents of the bowl back into the tank shall be prohibited.

906.2 Connections.

Fixtures having concealed slip-joint connections shall be provided with an access panel or utility space so arranged as to make the slip connections accessible for inspection and repair.

907 Water Closets.

907.1 Public Use.

Water-closet bowls for public use shall be of the elongated type.

907.2 Flushing Device.

Water-closet tanks shall have a flushing capacity sufficient to properly flush the water-closet bowls with which they are connected. The average maximum flushing capacity shall not exceed 3½ gallons per flush.

907.3 Float Valves.

Float valves in lowdown tanks shall close tight and provide water to properly refill the trap seal in the bowl.

907.4 Close-Coupled Tanks.

The flush-valve seat in close-coupled water-closet combinations shall be 1-inch or more above the rim of the bowl, so that the flush-valve will close even if the closet trapway is clogged; or any closets with flush valve seats below the rim of the bowl shall be so constructed that in case of trap stoppage, water will not flow continuously over the rim of the bowl.

907.5 Automatic Flush Valve.

Flushometer shall be so installed that they will be readily accessible for repairing. When the valve is operated, it shall complete the cycle of operation automatically, opening fully and closing positively under the service pressure. At each operation the valve shall deliver water in sufficient volume and at a rate that will thoroughly flush the fixture and refill the fixture trap. Means shall be provided for regulating flush-valve flow. Not more than one fixture shall be served by a single flush valve. Protection against backflow shall be provided as specified in paragraph 905.

907.6 Seats.

Water closets shall be equipped with seats of smooth non-absorbent material. All seats of water closets provided for public use shall be of the open-front type. Integral water-closet seats shall be of the same material as the fixture.

908 Urinals.

908.1 Automatic Flushing Tank.

Tanks flushing more than one urinal shall be automatic in operation and of sufficient capacity to provide the necessary volume to flush and properly cleanse all urinals simultaneously.

908.2 Urinals Equipped with Automatic Flush Valves.

Flushometers shall be as prescribed in paragraph 907.5 and no valve shall be used to flush more than one urinal.

908.3 Trough Urinals.

Trough urinals shall be permitted only in places of occasional occupancy. They shall be not less than 6-inches deep and shall be furnished with one-piece backs and have strainers with outlets at least 1½-inches in diameter. The washdown pipe shall be perforated so as to flush with an even curtain of water against the back of the urinal. This pipe shall be securely clamped as high as practicable to the back of the urinal. Trough urinals shall have tanks with a flushing capacity of not less than 1½ gallons of water for each 2-feet of urinal length.

908.4 Equivalent Length.

Trough urinals shall be figured on the basis of one (1) urinal for each 18-inches of length, i.e.

24-in. trough equals 1 urinal.

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36-in. trough equals 2 urinals.

48-in. trough equals 2 urinals.

60-in. trough equals 3 urinals.

72-in. trough equals 4 urinals.

908.5 Floor-Type Urinals.

Floor-type trough urinals are prohibited.

908.6 Surrounding Materials.

Wall and floor space to a point 1-foot in front of urinal lip and 4-feet above the floor, and at least 1-foot to each side of the urinal shall be lined with non-absorbent material.

909 Strainers and Fixture Outlets.

909.1

All plumbing fixtures, other than water closets and siphon-action wash-down or blowout urinals, shall be provided with metal strainers having waterway area complying with paragraph 901.1. Acetal plastic may be used as an alternate material.

910 Lavatories.

910.1 Waste Outlets.

Lavatories shall have waste outlets not less than 1¼-inches in diameter. Wastes may have open strainers or may be provided with stoppers.

911 Shower Receptors and Compartments.

911.1 Shower.

All shower compartments, except those having metal enameled or approved precast receptors, shall have a lead or copper shower pan or the equivalent thereof or as determined by the Plumbing Official. The pan shall turn up on all sides at least 4-inches above finished floor level. Traps shall be so constructed that the pan may be securely fastened to the trap at the seepage entrance making a watertight joint between the pan and trap. Shower receptacle waste outlets shall be not less than 2-inches and having removable strainer.

Laminated asphalt paper and plastic material may be used for shower pan and shall consist of 8 plies of kraft paper bonded by 7 layers of asphalt with 3 layers of the asphalt reinforced with glass fibers, faced with polyethylene, and having a total weight of not less than 0.40 pounds per square foot. Materials shall comply with the tests established by the Federal Housing Administration publication of 30 January 1963 entitled "Test Procedure to Determine Suitability of Materials for Use as Shower Pans."

A non-metallic plastic waterproof membrane of nominal thirty-thousandths (0.030) inch thick, non-plasticized Polyvinyl Chloride (PVC) sheet metal designed for concealed water proofing application. The material tested in accordance with ASTM D-1004, D-2240, D-412, D-1790, E-96 and FHA 4900.1.

911.2 Construction.

Floors under shower compartments shall be laid on a smooth and structurally sound base and shall be lined and made watertight with sheet

lead, copper or other acceptable materials. Shower compartments located in basements, cellars, or in other rooms in which the floor has been laid directly on the ground surface need not be lined.

911.3 Public or Institutional Showers.

Floor of public shower rooms shall be drained in such a manner that no waste water from any head will pass over floor areas occupied by other bathers.

911.4 Walls.

Shower compartments shall have walls constructed of smooth, non-corrosive and non-absorbent waterproof materials to a height of not less than 6-feet above the floor.

911.5 Joints.

Built-in tubs with overhead showers shall have waterproofed joints between the tub and non-absorbent waterproof wall materials.

911.6 Shower Heads

All showers used for other than therapeutic or safety purposes shall be equipped with a flow regulating device to limit total flow to a maximum of 3 gpm per head.

912 Sinks.

912.1 Waste Outlets.

Sinks shall be provided with waste outlets not less than 1½-inches in diameter. Waste outlets may have open strainers or may be provided with stoppers.

912.2 Food Grinders.

Sinks on which a food grinder is installed shall have a waste opening not less than 3½-inches in diameter.

913 Food Waste Grinder Units.

913.1 Separate Connections.

Domestic food waste disposal units may be connected and trapped separately from any other fixture or compartment. Units may have either automatic or hand-operated water-supply control. (See paragraph 1204.)

913.2 Grease Interceptors.

No food waste grinder shall be connected through a grease interceptor.

913.3 Commercial-Type Grinders.

Commercial-type food grinders shall have an automatic water-supply and shall be provided with not less than a 2-inch waste line. Back waste shall be trapped and vented as provided in other sections of this Code.

914 Drinking Fountains.

914.1 Design and Construction.

Drinking fountains shall conform to American Standard Specifications for Drinking Fountains. (ANSI A112.11-1973.)

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914.2 Protection of Water Supply.

Stream projectors shall be so assembled as to provide an orifice elevation as specified by American Standard Air Gaps in Plumbing Systems (ASA A40.14-1942) and American Standard Backflow Preventers in Plumbing Systems (ASA A40.16-1943.)

915 Floor Drains.

915.1 Floor Drains.

Floor drains shall be installed in all public toilet rooms, public bathrooms and public restrooms. (See definition of Public.)

Where floor coverings do not require mopping, scrubbing or hosing down by their maintenance programs and use of the public toilet is restricted to a limited or restricted public, installation of floor drains may be waived by the Plumbing Inspector."

915.2 Traps and Strainers.

Floor drains shall have metal traps and a minimum water seal of 3-inches and shall be provided with removable strainers. The open area of strainer shall be at least two-thirds of the cross-section area of the drain line to which it connects.

915.3

Floor drains shall be of a size to serve efficiently the purpose for which it is intended, but in no case less than 2-inches, except that for commercial buildings, schools, dormitories and institutions, floor drains shall be not less than 3-inches.

915.4

Acid resisting floor drains shall have Borosilicate Glass Traps where installed as part of a glass drainline system.

916 Dishwashing Machines.

916.1 Protection.

Domestic dishwashing machines shall meet requirements in paragraph 1204.3.

916.2 Separate Trap.

Each residential dishwasher waste shall be connected as follows:

1. Indirectly through a vented trap or a properly trapped and vented fixture; or
2. Through a wye connection into the tail piece of a sink or into the body of a disposal unit with the flexible dishwasher hose looped up to within 2" of the bottom of the counter top.

916.3 Air Gap.

Commercial dishwashing machines shall be connected through an air gap or as provided in Chapter 11 "Indirect Waste Piping and Special Wastes."

916.4 Hot Water.

Dishwashing machines or similar dishwashing equipment not in private living quarters or dwelling units shall be provided with water at 180 deg. F for sterilization.

917 Multiple Wash Sinks.

917.1 Circular Type.

Each 18-inches of wash sink circumference (circular type) shall be equivalent to one lavatory.

917.2 Straight-Line Type.

Multiple wash sinks of the straight-line type shall have hot and cold combination spouts not closer than 18-inches from adjacent similar spouts and each spout shall be considered the equivalent of one lavatory.

918 Garbage-Can Washers.

918.1 Discharge.

Garbage-can washers shall not discharge through a trap serving any other device or fixture.

918.2 Interceptor.

The discharge from a garbage-can washer shall be connected through an interceptor.

918.3 Baskets.

The receptacle receiving the wash from garbage-cans shall be provided with a basket or similar device to prevent the discharge of large particles into the building drainage system.

918.4 Connections.

Water Supply Connections shall conform to paragraph 1204.3.

919 Laundry-Trays.

919.1 Waste-Outlets.

Each compartment of a laundry-tray shall be provided with a waste-outlet not less than 1½-inches in diameter and with a stopper.

919.2 Overflow.

Laundry-tray overflows shall conform to the requirements of paragraph 903.1.

920 Washing Machines for Residences.

920.1 Protection.

Domestic washing machines shall meet requirements in Section 1204.3.

920.2 Separate Trap.

Each unit shall be separately trapped or discharge indirectly into a properly trapped and vented fixture.

921 Special Fixtures and Specialties.

921.1 Water and Drain Connections.

Baptistries, ornamental and lily pools, aquaria, ornamental fountain basins and similar constructions when provided with water supplies shall be protected from back-siphonage as required in paragraph 1204.3.

921.2 Dental Vacuum Sink.

A vacuum drain apparatus may be installed that is drained into a central vacuum system and pump which, in turn, is drained indirectly through a vented P-trap into the main drain system.

Venting of the sink is not required since all air in the drain system is drawn into the vacuum pump and vented to atmosphere at the pump.

(Note: See Appendix "H" for Department of Insurance Guidelines for determining total occupant content and division of occupants by percentage.)

TABLE 922.2 — MINIMUM FACILITIES¹

Type of Building or Occupancy ²	Water Closets	Urinals	Lavatories	Bathub or Showers	Drinking Fountain ³
Dwelling or Apt. House ^{4, 10}	1 for each Dwelling or Apartment Unit	1 for Each Apartment or Dwelling Unit.	1 for Each Apartment or Dwelling Unit.	
Schools ⁵	Male Female				
Elementary	1 per 60 1 per 35	1 per 30 Male	1 per 60 Persons.		1 per 75 Persons.
Secondary	1 per 100 1 per 45	1 per 30 Male	1 per 100 Persons.		1 per 75 Persons.
College—Academic	Male Female 1 per 100 1 per 60	1 per 110 Male	Male Female 1 per 150 1 per 100		1 per 75 Persons.
Office or Public Buildings ^{11, 12, 14} or Institutions (other than for patient use)	No. of Persons Fixtures M. F. 1-15 1 1 16-35 2 2 36-55 3 4 56-80 4 5 81-100 5 6 101-150 6 8 1 Fixture for each 40 Additional Persons	Wherever urinals are provided for men or women, one water closet less than the number specified may be provided for each urinal installed except that the number of water closets in such cases shall not be reduced to less than 2/3 of the minimum specified for men and 3/4 of the minimum specified for women.	No. of Persons Fixtures 1-15 1 16-35 2 36-60 3 61-90 4 91-125 5 1 Fixture for Each 45 Additional Persons.		1 for Each 75 Persons.
Manufacturing, Warehouses, Workshops, Loft Buildings, Foundations and similar Establishments ^{6, 11, 12}	No. of Persons Fixtures M. F. 1-9 1 1 10-24 2 2 25-49 3 4 50-74 4 5 75-100 5 6 1 Fixture for Each Additional 30 Employees	Same substitution as above.	1-100 Persons 1 Fixture for Each 10 Persons. Over 100, 1 for Each 15 Persons. ^{7, 8}	1 shower for each 15 persons exposed to excessive heat or to skin contamination with poisonous, infectious, or irritating material.	1 for Each 75 Persons.

or Occupancy ²	Water Closets	Urinals	Lavatories	Bathrooms or Showers	Fountains ³
Dormitories ⁹ 11	Male: 1 for Each 10 Persons Female: 1 for Each 8 Persons Over 10 Persons, Add 1 Fixture for Each 25 Additional Males and 1 for Each 20 Additional Females.	More than 100 persons—1 fixture for each 10 males or each eight females plus one additional fixture for each 25 additional males or each 20 additional females.	1 for Each 12 Persons. (Separate dental lavatories should be provided in community toilet rooms. Ratio of dental lavatories for each 50 persons is recommended.) Add 1 Lavatory for Each 20 Males, 1 for Each 15 Females.	1 for each 8 persons. In the case of women's dormitories, additional bathtubs should be installed at the ratio of 1 for each 30 females. Over 150 persons, add 1 fixture for each 20 persons.	1 for Each 75 Persons.
Theatres, Auditoriums, and Churches ¹¹	No. of Persons No. of Fixtures M. F. 1-100 2 2 101-200 3 3 201-400 4 4 Over 400, Add 1 Fixture for Each Additional 500 Males and 1 for Each 300 Females.	No. of Persons No. of Fixtures M 1-200 2 201-400 3 401-600 4 Over 600, Add 1 for Additional 300 Males.	No. of Persons No. of Fixtures 1-200 1 201-400 2 401-750 3 Over 750, 1 for Each Additional 500 Persons.		
Restaurant, Clubs and Lounges ¹¹	No. of Persons No. of Fixtures M. F. 1-50 1 1 51-150 2 2 151-300 3 4 Over 300 Add 1 Fixture for Each 200 Additional Persons.	No. of Persons No. of Fixtures M. 1-150 1 Over 150 Persons, Add One Fixture for Each 150 Men.	No. of Persons No. of Fixtures 1-150 1 151-200 2 201-400 3 Over 400, 1 Fixture for Each Additional 400 Persons.		
Shopping Center and Mercantile ¹² 13 14	No. of Persons No. of Fixtures M F 1-100 1 1 101-400 1 2 Over 400 persons, add 1 fixture for each additional 500 males and 300 females.	No. of Males No. of Fixtures 1-300 1 301-600 2 Over 600, add one urinal for each additional 300 males.	No. of Persons No. of Fixtures 1-400 1 401-1000 2 Over 1000 persons, add 1 fixture for each additional 500 persons.		1 for each 1000 persons with a minimum of 1 fixture for each floor level.
M—Male, F—Female.					

¹The figures shown are based upon one fixture being the minimum required for the number of persons indicated or any fraction thereof.

²Building category not shown on this table. Will be considered separately by the Plumbing Official.

³Drinking fountains shall not be installed in toilet rooms.

⁴Kitchen Sinks—1 for each dwelling or apartment unit.

⁵This schedule has been adopted (1958) by the National Council on Schoolhouse Construction.

- ⁸As required by the American Standard Safety Code for Industrial Sanitation in Manufacturing Establishments (ASA Z4.1-1955).
- ⁹Where there is exposure to skin contamination with poisonous, infectious, or irritating materials, provide 1 lavatory for each 5 persons.
- ¹⁰4-lineal-inches of wash sink or 18-inches of a circular basin, when provided with water outlets for such space, shall be considered equivalent to 1 lavatory.
- ¹¹Laundry trays, 1 for each 50 persons. Slop sinks, 1 for each 100 persons.
- ¹²Washing machines—water and drain connections in each dwelling or apartment unit unless central washing facilities are provided for the specific use of the occupants on the premises. One (1) washer for each eight apartments.
- ¹³The installation of female urinals shall be optional.
- ¹⁴For each separate building and each rentable space in shopping centers having 2500 gross square feet area and less and having 5 or less employees, one toilet room with lockable door may be provided.
- ¹⁵The number of persons shall be calculated on the basis of 100 square feet of net area per person. For determining the number of fixtures required, the total number of persons shall be divided into 70% females and 30% males (40% Females & 60% Males for *Exhibition Facilities*). Net area is 70% of the total gross area of the store or leaseable areas. For mall-type centers and *exhibition facilities*, areas with individual *toilet* facilities and arcade areas are not to be included in the total gross area. Single leased spaces located in mall-type centers and *exhibition facilities* having an area of 50,000 gross square feet or more shall have individual public *toilet* facilities provided within its leased area. Restaurants, clubs, and lounges located within a mall-type center and *exhibition facility* shall have individual public *toilet* facilities sized in accordance with the proper section of this table. Public toilet facilities in mall-type centers and *exhibition facilities* other than individual public toilet facilities shall be located on the arcade and no person shall have to travel more than 200 feet to have access to a public *toilet* room. On multi-story malls and *exhibition facilities* public *toilet* facilities shall be provided on each floor level. Individual public toilets may be used as toilet facilities for employees of that specific area. *For exhibition facilities used periodically, employees in leased spaces less than 50,000 gross square feet in area may use the public toilet facilities.*
- ¹⁶For each separate building and each rentable space in shopping centers having 2500 gross square feet area or less, drinking fountains are optional.

General. In applying this schedule of facilities, consideration must be given to the accessibility of the fixtures. Conformity purely on a numerical basis may not result in an installation suited to the need of the individual establishment. For example, schools should be provided with toilet facilities on each floor having classrooms.

Temporary workingmen facilities:

1 water closet and 1 urinal for each 30 workmen.	
24-in. urinal trough — 1 urinal	48-in. urinal trough — 2 urinals
36-in. urinal trough — 2 urinals	60-in. urinal trough — 3 urinals
	72-in. urinal trough — 4 urinals

921.2 Approval.

Specialties requiring water and waste connections shall be submitted for approval of the Plumbing Official.

922 Minimum Facilities.**922.1**

Wherever plumbing fixtures are installed, the minimum number of each type of fixture installed shall be in accordance with Table 922.2, unless otherwise specifically provided. (Note: See Appendix "H" for Department of Insurance Guidelines for determining total occupant content and division of occupants by percentage).

923 Water Heaters and Hot Water Storage Tanks. (Refer also to Section 1215.)**923.1 General**

(a) Water heater is an appliance for supplying potable hot water for domestic or commercial purposes. It may be used for space heating if the water temperature does not exceed 150°F.

(b) All storage tanks and water heaters shall be clearly and indelibly marked showing the allowable safe working pressure.

923.2 Location.

(a) Water heaters should be so located to provide as short a run of hot water piping to fixtures as possible and accessible to all tenants or maintenance personnel, as the case may be.

(b) Water heaters and storage tanks shall be so located and connected that it will be readily accessible for observation, maintenance, servicing and replacement.

923.3 Prohibited Installations.

Water heaters (using solid, liquid or gas fuel) with the exception of those having sealed combustion systems, shall not be installed in bathrooms and bedrooms. However, water heaters of the automatic storage type may be installed as replacement in a bathroom, when specifically authorized by the administrative authority, provided they are properly vented and supplied with adequate combustion air.

923.4 Clearances.

Water heaters shall be positioned in relation to combustible construction as recommended by manufacturer.

923.5 Connections.

(a) A shut-off valve shall be provided in the cold water supply to each hot water heater or storage tank and shall be accessible on the same floor and within three (3) feet of the heater or tank.

(b) The method of connecting a circulating water heater to the tank shall assure proper circulation of water through the heater, and permit a safe and useful temperature of water to be drawn from the tank.

923.6 Safety Devices.

Refer to Section 1215.

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923.7 Sediment Drains.

A suitable water valve or cock, through which sediment may be drawn off or the heater or tank emptied, shall be installed at the bottom of the heater or tank.

923.8 Anti-Syphon Devices.

Means acceptable to the administrative authority shall be provided to prevent syphoning in any water heater or tank to which any water heater or tank is connected.

A cold water "dip" tube with a hole at the top or a vacuum relief valve installed in the cold water supply line above the top of the heater or tank may be acceptable for this purpose.

Bottom fed heaters or bottom fed tanks connected to water heaters shall have a vacuum relief valve installed.

The vacuum relief valve shall be in compliance with the appropriate Standard A.S.A. Z21.22.

924 Toilet Rooms and Water Fountains for the Physically Handicapped.

(See Volume I N. C. State Building Code Chapter 11X when those facilities are required and other reference sections applicable.)

924.1 Toilet Rooms

On every floor where toilet rooms are planned in buildings requiring accessibility, one toilet room for men and one toilet room for women shall have at least one fixture of each type provided, to meet the requirements of this Section. Each building shall have a minimum of 2% of total fixtures of each type to meet the requirements of this Section.

Where several toilet rooms with group facilities are provided on a floor, at least one toilet room per floor for men and one for women, if both are provided, shall have at least one fixture of each type to meet the requirements of Sections. (a) through (j).

Where toilet rooms do not have group facilities but are single individual toilet rooms, the toilet room itself shall be considered the toilet stall as well as a toilet room, and at least one such room for men and one such room for women shall meet the requirements of (a), (b)3, 4, 5, (c), (d), (e), (g), (h), (i), (j).

In small business establishments, a toilet stall, as described in 6(b), may be accepted as a toilet room with the lavatory in an adjacent space. The space adjacent to the small door shall have the "turn-around" space specified in (a).

(a) A minimum of 5 feet x 5 feet clear floor space shall be provided and the entrance door shall be located on one side of this clear width and open out or slide. Where total available floor space is a particularly crucial concern, and where toe space is provided under cabinets, toe space of no more than 6 inches in depth and a minimum of 8¾ inches in height on any one side, can be allowed to supplant part of the 5 feet x 5 feet clear floor space.

EXAMPLE: If toe space 8¾ inches in height and 6 inches in depth were provided under cabinets on two opposite sides of the toilet room, the remaining clear floor space in addition to the toe space is 4 feet x 4 feet. However, if the depth of the toe space is 12 inches on each of two opposite sides of a toilet room, the additional clear floor space would still have to be 4 feet x 4 feet.

(b) "Lawn sprinkler systems shall be equipped with an approved Backflow Preventer to protect against contamination of the potable water system. The following devices shall be acceptable:

Anti-Syphon Vacuum Breakers, Reduced Pressure Zone Backflow Preventer, Double Check Type Back Pressure Backflow Preventer equipped with gate valves and test cocks.

Above devices shall first have been certified by a recognized testing laboratory acceptable to the Plumbing Official as meeting the requirements of: ANSI-A-40.6, ASSE-1001, ASSE-1011, ASSE-1012, ASSE-1013, ASSE-1015 or AWWA-C-506-69.

Anti-Syphon valves shall be installed downstream of the last control valve, at least 6 inches above the level of the highest sprinkler head.

All protective devices shall be installed in an accessible location, to allow for Inspection and Maintenance and to isolate the sprinkler system from all other piping in the system."

1205.5 Fixture Valve Outlets With Hose Attachments, Hose Bibbs and Lawn Hydrants.

Fixture valve outlets with hose attachments, hose bibbs and lawn hydrants shall be protected by an approved back-siphonage backflow preventer or vacuum breaker on the discharge side of the valve. Back siphonage backflow preventers may be installed directly on hose outlet connection threads. Vacuum breakers shall be installed at least 6" above the highest point of usage. Approved valves shall comply with applicable sections of American Society of Sanitary Engineering Standard—ASSE 1011-Hose Bibb Vacuum Breakers and ASSE 1019 Self-Draining Anti-Siphon Sill Cock.

1206 Water-Distribution Pipe, Tubing and Fittings.

1206.1

(a) Materials for water distribution pipe and tubing shall be brass, copper water tube minimum Type "M" or hard welded type D Copper water tube when used above ground, copper alloy welded water tube, stainless steel water tube minimum Grade "G" when used above ground, cast iron, wrought iron, open-hearthed iron or steel, chlorinated polyvinyl chloride (CPVC) with appropriate approved fittings when used above ground in sizes up to (2) inches, or polybutylene tubing with appropriate approved fittings. Stainless steel shall not be used below ground in tidal areas. All threaded ferrous pipe and fittings shall be galvanized (zinc coated) or cement lined. When used underground in corrosive soil, all ferrous pipe and fittings shall be coated with coal tar enamel or other coatings approved for such purposes by a recognized standards organization, and the threaded joints shall be coated and wrapped after installation. (See Chapter V for Standards on Coal Tar Enamel Coatings)

Chlorinated polyvinyl chloride (CPVC) pipe and fittings and Polybutylene (PB2110 pipe and tubing) shall not be used in applications where temperature exceeds 180 degrees F, and pressure exceeds 100 psi. continuously.

(b) Underground piping for water service and lawn sprinkling systems, when installed outside of the foundation walls of the building may be in Pressure Rated plastic piping as listed in Table 505. In each case the method of installation shall be in accordance with the manufacturer's recommendations as approved by the Plastic Pipe Institute. The minimum working pressure to be 160 PSI, with permanent identification markings.

(c) No existing metallic water service piping used for electrical grounding shall be replaced with non-metallic pipe for tubing until other grounding means are provided which are satisfactory to the proper administrative authority having jurisdiction.

Note 1: Section 2501(a) and (c) of Volume I states that no combustible materials shall enter into construction of wall, floor and roof assemblies unless such assem-

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blies have been tested in accordance with ASTM-E-119 where the code requires such assemblies to have an hourly fire resistance rating.

Note 2: Installation of CPVC pipe and fittings shall be in accordance with Appendix A2 of ASTM Standard D-2846 and manufacturers' recommendations.

Note 3: Installation of Polybutylene (PB2110) pipe and tubing shall be in accordance with installation instructions in Appendix C of this Code.

1206.2

Inaccessible water piping under floor slabs shall be minimum Type L copper tube, brass, minimum grade "H" stainless steel water tube, cast iron, polybutylene pipe using fittings having non-metallic parts, galvanized steel or galvanized wrought iron, except that galvanized steel shall be protected when used under floor slabs in corrosive soils. All ferrous piping and fittings shall be coated with coal tar enamel or other coatings approved for such purpose by a recognized standard organization and the threaded joints shall be coated and wrapped after installation.

1206.3

Except as permitted in paragraph 1206.4, the underground water-service pipe and the building drain or building sewer shall be not less than 5-feet apart horizontally and shall be separated by undisturbed or compacted earth. When copper tubing is used for water service pipe, it must be minimum type "L".

1206.4

The water service pipe may be placed in the same trench and on the same level with the building sewer or drain provided that the sewer or drain is of leaded cast iron or ABS or PVC with solvent cemented joints.

When the above conditions are not met and a common trench is used, the bottom of the water service line must be at least 12 inches above the highest point of the top of the sewer or drain and shall be placed on a solid shelf located at one side of the common trench.

1206.5 Stop-and-Waste Valve Combination.

Combination stop-and-waste valves and cocks shall not be installed in an underground service pipe.

1206.6 Private Water Supply.

No private water supply shall be inter-connected with any public water supply.

1207 Water Pumping and Storage Equipment.

1207.1 Pumps and Other Appliances.

Water pumps, tanks, filters, softeners and all other appliances and devices shall be protected against contamination.

1207.2 Water-Supply Tanks.

Potable water-supply tanks shall be properly covered to prevent the entrance of foreign material or insects into the water supply. Soil or waste lines shall not pass directly over such tanks.

1207.3 Pressure Tanks, Boilers, and Relief Valves.

The drains from pressure tanks, boilers, relief valves and similar equipment shall be connected to the drainage system through an indirect waste.

1211 Water Supply Control.**1211.1 Water Supply Control.**

A main shut-off valve shall be provided on the water service pipe near the curb. A shut-off valve with a drip valve shall also be provided inside the building near the point of entrance of the water service pipe. The valve shall be either operable from the occupied space or located within 3 feet of the crawl space access door. A maximum of 4 feet of exposed water service piping is permitted between the shut-off valve and the point at which the pipe rises above grade or where it enters the building. Valve may be located in a valve box immediately outside the foundation wall with an above ground drain extended through the foundation wall to a hose end drain valve on the outside of the foundation wall.

1211.2 Tank Controls.

Supply lines taken from pressure or gravity tanks shall be valved at or near the source.

1211.3 Separate Controls for Each Family Unit.

In two-family or multiple dwellings, each family unit shall be controlled by an arrangement of shut-off valves which permit each group of fixtures or the individual fixtures to be shut off without interference with the water-supply to any other family unit or portion of the building.

1211.4 Group Fixtures.

A group of fixtures means two or more fixtures adjacent or near each other. In a one-family house one or two bathrooms adjacent or one over the other may be considered a group.

1211.5 Buildings Other Than Dwellings.

In all buildings other than dwellings shut-off valves shall be installed, which permit the water-supply to all equipment in each separate room to be shut off without interference with the water-supply to any other room or portion of the building.

1211.6 Water Heating Equipment.

A shut-off valve shall be provided in the cold-water branch line to each water-storage tank or each water heater.

1212 Water-Supply Distribution.**1212.1 Water-Service Pipe.**

The water-service pipe from the street main to the water-distribution system for the building shall be of sufficient size to furnish an adequate flow of water to meet the requirements of the building at peak demand, and in no case shall be less than $\frac{3}{4}$ -inch nominal diameter.

1212.2 Demand Load.

The demand load in the building water-supply system shall be based on the number and kind of fixtures installed and the probable simultaneous use of these fixtures.

1213 Procedure in Sizing the Water-Distribution System of a Building.

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1213.1 Size of Potable Water Piping.

(a) The size of each water meter and each potable water supply pipe from the meter or other source of supply to the fixture supply branches, risers, fixtures, connections, outlets or other uses shall be based on the total demand and shall be determined according to the methods and procedures outlined in this section.

(b) Whenever a water filter, water softener or similar water treating device, backflow prevention device or similar device is installed in any water supply line, the pressure loss through such devices must be included in the pressure loss calculations of the system, and the water supply pipe and meter shall be adequately sized to provide for any such pressure loss.

No water filter, water softener, backflow prevention device or similar device regulated by this code shall be installed in any potable water supply piping when the diameter of the inlet or outlet of any such device or its connecting piping is less than the diameter of such water supply piping, or when the installation of such device produces an excessive pressure drop in any such water supply piping.

All such devices shall be of a type approved by the Administrative Authority and shall be tested for flow rating and pressure loss by an approved laboratory or recognized testing agency to standards consistent with the intent of this chapter. The maximum rated flow and the pressure loss shall be stamped legibly on the device or on a metal label, permanently attached to the device, and shall be in the following form:

MAXIMUM PRESSURE DROP	
Flow Gallons per minute	Pressure Drop Pounds per square inch
5	—
10	—
15	—

NOTE: The final figure in the flow rate column shall be the maximum rated flow or capacity of the device.

(c) The quantity of water required to be supplied to every plumbing fixture shall be represented by fixture units, as shown in Table 12-A. Equivalent fixture valves shown in Table 12-A include both hot and cold water demand.

(d) Where the maximum length of supply piping is two hundred (200) feet or less, each water piping system of fifty (50) fixture units or less shall be sized in accordance with the values set forth in Table 12-B of this section. Other systems within the range of Table 12-B may be sized from that table or by the method set forth in sub-section (e) of this section.

(e) Except as provided in subsection (d) of this section, the size of each water piping system shall be determined in accordance with the procedure set forth in Appendix A of this code (Recommended Rules for Sizing the Water Supply System).

(6) Non-potable water lines.

- (7) The size and material of irrigation water piping installed outside of any building or structure and separated from the potable water supply by means of an approved air gap or backflow prevention device is not regulated by this code. The potable water piping system supplying each such irrigation system shall be adequately sized as required elsewhere in this chapter to deliver the full connected demand of both systems.

1213.2

When required by the Plumbing Official, the sizing of the water-distribution system shall be calculated by a registered mechanical engineer or other acceptable authority.

1213.3 Size of Fixture-Supply.

The minimum size of a fixture-supply pipe shall be as follows:

Type of Fixture or Device	Pipe Size (Inches)	Type of Fixture or Device	Pipe Size (Inches)
Bath Tubs	$\frac{1}{2}$	Sinks Flushing Rim	$\frac{3}{4}$
Combination Sink and Tray	$\frac{1}{2}$	Urinal (Flush Tank)	$\frac{1}{2}$
Drinking Fountain	$\frac{3}{8}$	Urinal (Direct Flush Valve)	$\frac{3}{4}$
Dishwasher (Domestic)	$\frac{1}{2}$	Water Closet (Tank Type)	$\frac{3}{8}$
Kitchen Sink, Residential	$\frac{1}{2}$	Water Closet (Flush Valve Type)	1
Kitchen Sink, Commercial ...	$\frac{3}{4}$	Hose Bibbs	$\frac{1}{2}$
Lavatory	$\frac{3}{8}$	Hose Bibbs— Toilet Rooms	$\frac{1}{2}$
Laundry Tray, 1, 2 or 3 Compartments	$\frac{1}{2}$	Wall Hydrant	$\frac{1}{2}$
Shower (Single Head)	$\frac{1}{2}$	Washing Machines	$\frac{1}{2}$
Sinks (Serv., Slop)	$\frac{1}{2}$		

For fixtures not listed, the minimum supply branch may be made the same as for a comparable fixture.

1213.4 Minimum Pressure.

Minimum, fairly constant, service pressure, at the point of outlet discharge shall be not less than 8 psi. for all fixtures except for direct flush-valves, for which it shall be not less than 15 psi., and except where special equipment is used requiring higher pressure. In determining the minimum pressure, allowance shall be made for the pressure drop due to friction loss in the piping system during maximum demand periods as well as head, meter, and other losses in the system.

1213.5 Auxiliary Pressure, Supplementary Tank.

If the residual pressure in the system is below the minimum allowable at the highest water outlet when the flow in the system is at peak demand, an automatically controlled pressure tank or gravity tank shall be installed, of sufficient capacity to supply sections of the building installation which are too high to be supplied directly from the public water main.

TABLE 12-A
Equivalent Fixture Units

(Includes Combined Hot and Cold Water Demand)

Fixture	Number of Fixture Units	
	Private Use	Public Use
Bar sink	1	2
Bathtub (with or without shower over)	2	4
Dental unit or cuspidor	—	1
Drinking fountain (each head)	—	1
Hose bibb or sill cock (standard type)	3	5
House trailer (each)	6	6
Laundry tub or clotheswasher (each pair of faucets)	2	4
Lavatory	1	2
Lavatory (dental)	1	1
Lawn sprinklers (standard type, each head)	1	1
Shower (each head)	2	4
Sink* (bar)	1	2
Sink or dishwasher	2	4
Sink (flushing rim, clinic)	—	10
Sink (washup, each set of faucets)	—	2
Sink (washup, circular spray)	—	4
Urinal (pedestal or similar type)	—	10
Urinal (stall)	—	5
Urinal (wall)	—	5
Urinal (flush tank)	—	3
Water closet (flush tank)	3	5
*Water closet (flushometer valve)	6	10
Water closet, low flush type	1	

Water supply outlets for items not listed above shall be computed at their maximum demand, but in no case less than

$\frac{3}{8}$ inch	1	2
$\frac{1}{2}$ inch	2	4
$\frac{3}{4}$ inch	3	6
1 inch	6	10

*See subsection (j) of Section 1213.1 for method of sizing flushometer valve installations using Table 12-B

(f) Provision shall be made to permit water on the building side of the reducing valve to flow back into the main when the building pressure exceeds the main supply pressure due to thermal expansion. Reducing valves with build-in by-pass check valves will be acceptable.

An integral by-pass check valve shall be capable of opening to permit a reverse flow of water through the reducing valve to prevent a build-up of system pressure by thermal expansion of the water with an increase of reduced pressure not exceeding 2 psi above the prevailing initial pressure.

(g) The valve shall be designed to fall open to permit uninterrupted water flow.

(h) All regulators and strainers must be so constructed and installed as to permit repair or removal of parts without breaking a pipe line or removing the valve and strainer from the pipe line.

1214 Hot-Water Distribution.

1214.1 Hot-Water Distribution Piping.

The sizing of the hot-water distribution piping shall conform to good engineering practice (See paragraph 1213.1).

1214.2 Hot Water Supply.

The hot water supply on any fixture requiring hot water shall be installed on the left side of the fixture unless otherwise specified by the manufacturer.

1214.3 Shower Water Temperature Control

"The temperature of hot water supplied to showers in all occupancies, except living units that have individual water heaters, shall be a maximum of 116°F or the shower shall be controlled by an anti-scald valve of the pressure balance or thermostatic mixing type. Multiple shower units may be controlled by a master anti-scald valve."

1215 Hot Water Tanks or Heaters and Safety Devices.

1215.1 General.

(a) All automatically fired water tanks shall be equipped with the following minimum controls and devices as applicable:

- (1) Operating temperature controls.
- (2) High Limit temperature control with maximum thermostetting of 210° F. (energy cut-off).
- (3) A positive flame failure cut-off.
- (4) Approved and listed burner and controls;
Gas-fired—American Gas Association.
Oil-fired—Underwriter's Laboratories.
- (5) An approved type pressure relief and temperature relief valves or and approved type combination thereof. New installations shall comply with General Statutes 66-27.1 (see appendix). Temperature relief ratings shall be in accordance with ASA standard Z21.22 (1958).

(b) No individual, firm, corporation, or business shall install, sell or offer for sale any automatic hot water tank or heater of 120 gallon capacity or less which does not have installed thereon by the manufacturer

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of such tank or heater an American Society of Mechanical Engineers and National Board of Boiler and Pressure Vessel Inspectors approved type pressure-temperature relief valve, and so labeled by the manufacturer's identification stamped or cast upon the tank or heater or upon a plate secured to it.

(c) Relief valves shall be connected to the top of the tank with the spindle vertical, if possible, either directly to a tapped or flanged opening in the tank, or to a fitting connected to the tank by a close nipple. The temperature sensing probe shall be actuated by the water within the top six inches of the tank and the relieving capacity of any one valve shall equal or exceed the heat (BTU's) input of the heater or to the storage tank. Relief Valve pressure setting shall not exceed the tank or heater manufacturer's rated working pressure and thermosetting shall not exceed 210° F. The outlet of a pressure, temperature, or other relief valve shall not be connected to the drainage system as a direct waste, but shall be piped to a floor drain or other location that will reduce the possibility of personal injury if the valve should discharge. Discharge piping, if any, to be same size as relief valve outlet, or larger, and the termination shall not be threaded.

(d) For installation with a separate storage tank, relief valves shall be installed on the tank and there shall not be any type of valve installed between the water heater and the storage tank. When shut-off valves are provided between the heater and storage tank, additional approved type safety relief valve(s) shall be installed on the heater.

(e) Dip tubes, supply and hot water nipples, supply water baffles or heat traps when used in hot water supply storage tanks or heaters shall be constructed and tested to withstand a temperature of 400°F. without deteriorating in any manner, and the tank so labeled by the manufacturer.

(f) Copper or steel coil tube type hot water supply heaters which are not covered by the ASME Boiler Code that have been designed and constructed as safe as otherwise provided in the ASME Code and are AGA or U. L. approved shall be equipped with approved safety devices as required by this section.

(g) A hot water supply or storage tank, fired or unfired, shall not be used for space heating if the water temperature exceeds 150°F.

(h) All storage tanks shall have clearly and indelibly stamped in metal, or so marked upon a plate welded thereto, or otherwise permanently attached, the maximum allowable working pressure. Such markings shall be in an accessible position outside of the tank so as to make inspection or reinspection readily possible. All storage tanks for domestic hot water shall meet the applicable ASME standards.

(i) All electric, gas and oil water heaters must be approved and listed by nationally recognized testing laboratories such as A.G.A., U.L., etc.; and all hot water tanks (fired or unfired) shall bear the ASME label of approval when required. The maximum allowable working pressure of a tank or heater shall in no case exceed the pressure indicated by the manufacturer's identification stamped upon the tank or upon a plate secured to it.

(j) Flue Connection—Each fired tank or fired coil heater shall be equipped with a minimum three inch diameter vent pipe or flue connected to an approved gas vent or chimney meeting the requirements of the State Building Code.

1215.2

Tanks or heaters that exceed any of the following limitations shall meet the requirements of the ASME Boiler Code, Section VIII and conformity shall be certified by the inspection and stamping of the National Board of Boiler and Pressure Vessel Inspectors.

- (1) A heat input of 200,000 BTU's per hour.
- (2) A water temperature of 200°F.
- (3) A nominal water containing capacity of 120 gallons.

(a) Each hot water supply tank or heater of more than 120 gallon capacity shall have at least one officially-rated ASME and NB approved type pressure relief valve or at least one officially-rated ASME and NB approved type pressure-temperature relief valve of the automatic reseating type set to relieve at or below the maximum allowable working pressure of the tank. When more than one relief valve is used on either hot water heating or hot water storage tanks, the additional valve or valves shall be officially-rated ASME and NB approved type and shall be set within the range not to exceed 20% of the lowest pressure at which any valve is set. Relief valve shall be spring loaded without disc guides on the pressure side of the valve. Relief valves shall be so arranged that they cannot be reset to relieve at a higher pressure than the maximum permitted by this paragraph.

(b) Pressure reducing valves shall be used in the water supply to the heater or tank where the static water pressure exceeds 75% of the water working pressure of the heater or tank.

(c) There shall be a stop and check valve in the water supply to the tank or heater.

1216 Miscellaneous.**1216.1 Drain Cock.**

All storage tanks shall be equipped with adequate drain cocks.

1216.2 Line Valves.

Valves in the water-supply distribution system, except those immediately controlling one fixture supply, when fully opened shall have a cross-sectional area of the smallest orifice or opening through which the water flows at least equal to the cross-sectional area of the nominal size of the pipe in which the valve is installed.

1216.3 Water Used for Processing.

Water used for cooling of equipment or similar purposes shall not be returned to the potable-water distributing system. When discharged to the building drainage system, the waste water shall be discharged through an indirect waste pipe or air gap.

CHAPTER XIII

DRAINAGE SYSTEM

1301 Materials.

1301.1 General.

Pipe, tubing, and fittings for drainage systems shall comply with the provisions in Chapter V.

1301.2 Specific Type.

Standards given in Table 505 apply to the specific materials approved for use and as indicated in the various paragraphs in this chapter as they apply to the drainage system.

1301.3 Above-Ground Piping Within Buildings and Piping in Race Ways or Tunnels.

Soil and waste piping for drainage system shall be cast iron, galvanized steel, galvanized wrought iron, lead, brass, borosilicate glass, copper pipe, copper tube, copper alloy welded tube, stainless steel tube or schedule 40 ABC, Foam Core or PVC-DWV as allowed in Section 504.2.

Cast iron soil pipe and fittings for soil, waste, vent conductors or building drains when above ground (unless otherwise specified) may be service weight.

(a) Vertical soil, waste and vent stacks shall be designed to control expansion and contraction, in accordance with accepted engineering practice, to the satisfaction of the administrative authority.

1301.4 Underground Piping Within Buildings.

All underground drains within buildings shall be cast iron soil pipe, lead, copper, heavy schedule borosilicate glass enclosed in polystyrene casing or plastic pipe as permitted in Table 505.

Black drainage and galvanized fittings may be used on drainage, waste and vents with galvanized pipe.

1301.5 Fittings.

Fittings on the drainage system shall conform to the type of piping used. Fittings on screwed pipe shall be of recessed drainage type. Black drainage and galvanized fittings may be used on drainage, waste and vents with galvanized pipe. (See Section 404).

Copper or cast copper alloy fittings shall be used with stainless steel tube.

1301.6 Acid Soil and Waste Piping.

For engineered acid soil and waste drainage systems the type of pipe shall be selected by a Professional Engineer registered in North Carolina. For non-engineered acid soil and waste drainage systems the piping shall be of a material

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which is designed and recommended by the manufacturer as suitable for the type of waste drained. Piping shall be installed in accordance with the manufacturer's installation instructions. When installed within buildings, piping of combustible materials shall be of a flame retardant type rated at least V-2 per UL-94. Concentrations of acid waste which are sufficient to adversely affect the conventional drainage system shall be suitably diluted or neutralized before interconnection (see also Section 1109.2). Fittings shall conform to the type of piping used.

Acid soil and waste piping within buildings when underground shall be heavy schedule borosilicate glass, heavy duty high silicon cast iron or schedule 40 Type II polypropylene with either wrapped or coated fittings on glass piping.

1302 Building Sewer.

1302.1 Separate Trenches.

The building sewer, when installed in a separate trench from the water service pipe, shall be cast iron sewer pipe, vitrified-clay sewer pipe, concrete sewer pipe, laminated bituminized fiber sewer pipe, asbestos sewer pipe, schedule 40 ABS, ABS Foam Core or PVC-DWV sewer pipe or ABS composite sewer pipe. Joints shall be water tight and root proof and all materials shall be installed according to the manufacturer's recommendations. (see Appendix C) All pipe and fittings shall bear the manufacturer's name or trademark. Refer to Section 1206.4 for regulations governing the installation of the building sewer and/or drain and water service line in the same trench.

1302.2 Sewer in Filled Ground.

A building sewer or building drain installed in filled or unstable ground shall be of cast-iron pipe, except that nonmetallic drains may be laid upon the approved concrete pad if installed in accordance with paragraph 1302.1.

1302.3 Sanitary and Storm Sewers.

Where separate systems of sanitary drainage and storm drainage are installed in the same property, the sanitary and storm building sewers or drains may be laid side by side in one trench.

1302.4 Old House Sewers and Drains.

Old house sewers and house drains may be used in connection with new building or new plumbing and drainage work only when they are found, on examination and test, to conform in all respects to the requirements governing new house sewers, and the Plumbing Official shall notify the owner to make the changes necessary to conform to this Code.

1302.5

Cleanouts on building sewers shall be located as set forth under paragraph 704.

1303 Drainage Piping Installation.

1303.1 Horizontal Drainage Piping.

Horizontal drainage piping shall be installed at a uniform slope following the land surface contour but at slopes not less than permitted in paragraphs 1303.2, 1303.3, and 1303.4.

1303.2 Small Piping.

Horizontal drainage piping of 3-inch diameter and less shall be installed with a fall of not less than $\frac{1}{4}$ -inch per foot.

1303.3 Large Piping.

Horizontal drainage piping larger than 3-inch diameter shall be installed with a fall of not less than $\frac{1}{8}$ -inch per foot.

1303.4 Minimum Velocity.

Where conditions do not permit building drains and sewers to be laid with a fall as great as that specified, then a lesser slope may be permitted provided the computed velocity will not be less than 2 fps.

1304 Fixture Units.**1304.1 Values for Fixtures.**

Fixture unit values as given in Table 1304.2 designate the relative load weight of different kinds of fixtures which shall be employed in estimating the total load carried by a soil waste pipe and shall be used in connection with the tables of sizes for soil, waste, and drain pipes for which the permissible load is given in terms of fixture units.

1304.2 Fixtures Not Listed.

Fixtures not listed in Table 1304.2 shall be estimated in accordance with Table 1304.3.

TABLE 1304.3

Fixture Drain or Trap Size	Fixture-Unit Value
1 $\frac{1}{4}$ -inches and smaller	1
1 $\frac{1}{2}$ -inches	2
2- inches	3
2 $\frac{1}{2}$ -inches	4
3- inches	5
4- inches	6

1304.3 Values for Continuous Flow.

For a continuous or semicontinuous flow into a drainage system, such as from a pump, pump ejector, air-conditioning equipment, or similar device, two fixture units shall be allowed for each gallon-per-minute of flow.

1305 Determination of Sizes for the Drainage System.**1305.1 Maximum Fixture-Unit Load.**

The maximum number of fixture units that may be connected to a given size of building sewer, building drain, horizontal branch, or vertical soil or waste stack is given in Tables 1305.2 and 1305.3.

1305.4 Minimum Size of Soil and Waste Stacks.

No soil or waste stack shall be smaller than the largest horizontal branch

TABLE 1304.2 — FIXTURE UNITS PER FIXTURE OR GROUP

Fixture Type	Fixture-Unit Value as Load Factors	Minimum Size of Trap ² Inches
1 Bathroom group consisting of water closet, lavatory and bathtub or shower stall.	Tank water closet 6 Flush-valve water closet 8	
Bathtub ¹ (with or without over head shower).	2	1½
Bathtub ¹ .	3	2
Bidet.	3	Nominal 1½
Clothes washer (domestic)	3	2
Clothes washer (commercial)	See 1304.4	See 1304.3
Combination sink and tray.	3	1½
Combination sink and tray with food disposal unit.	4	Separate traps 1½
Dental unit or cuspidor.	1	1¼
Dental lavatory.	1	1¼
Drinking fountain.	½	1
Dishwasher ² domestic.	2	1½
Floor drains ³ .	1	2
Kitchen sink, domestic.	2	1½
Kitchen sink, domestic with food waste grinder.	3	1½
Lavatory ⁴ .	1	Small P.O. 1¼ Large P.O. 1½
Lavatory ⁴ .	2	1½
Lavatory, barber, beauty parlor.	2	1½
Lavatory, surgeon's	2	1½
Laundry tray (1 or 2 compartments)	2	1½
Shower stall, domestic.	2	2
Showers (group) per head ² .	3	
Sinks.		
Surgeon's.	3	1½
Flushing rim (with valve).	8	3
Service (trap standard).	3	3
Service (P trap).	2	2
Pot, scullery, etc. ²	4	1½
Urinal, pedestal, syphon jet, blowout.	8	Nominal 3
Urinal, wall lip.	4	1½
Urinal stall, washout.	4	2
Urinal trough ² (each 2-ft. section)	2	1½
Wash sink ² (circular or multiple). each set of faucets.	2	Nominal 1½
Water closet, tank-operated.	4	Nominal 3
Water closet, valve-operated.	8	3
Water closet, low flush type.	1	

¹A shower head over a bathtub does not increase the fixture value.

²See Pars. 1304.3 and 1304.4 for methods of computing unit value of fixtures not listed in Table 1304.2 or for rating of devices with intermittent flows.

³Size of floor drain shall be determined by the area of surface water to be drained.

⁴Lavatories with 1¼ or 1½-inch trap have the same load value; larger P.O. plugs have greater flow rate.

**TABLE 1305.2 — BUILDING DRAINS AND SEWERS
& HORIZONTAL BRANCH DRAINS**

Diameter of Pipe	Maximum Number of Fixture-Units that may be Connected to Any Portion ¹ of the Building Drain or the Building Sewer ³			
	Fall Per Foot			
	1/16-Inch	1/8-Inch	1/4-Inch	1/2-Inch
Inches				
1½				3 ⁴
2			21	26
2½			24	31
3		20 ²	27 ²	36 ²
4		180	216	250
5		390	480	575
6		700	840	1,000
8	1,400	1,600	1,920	2,300
10	2,500	2,900	3,500	4,200
12	3,900	4,600	5,600	6,700
15	7,000	8,300	10,000	12,000

¹Includes branches of the building drain.²Not over two water closets.³No building drain or sewer shall be less than 4-inches in size.⁴See Section 1305.7 for minimum pipe size permitted below grade.**TABLE 1305.3 — HORIZONTAL FIXTURE BRANCHES
AND STACKS**

Diameter of Pipe	Maximum No. of Fixture Units That May Be Connected To:			
	Any Horizontal ¹ Fixture Branch	One Stack of 3 Stories in Height or 3 Intervals	More Than 3 Stories In Height	
			Total for Stack	Total at One Story or Branch Interval
Inches				
1¼	1	2	2	1
1½	3	4	8	2
2	6	10	24	6
2½	12	20	42	9
3	20 ²	30 ³	60 ³	16 ²
4	160	240	500	90
5	360	540	1,100	200
6	620	960	1,900	350
8	1,400	2,200	3,600	600
10	2,500	3,800	5,600	1,000
12	3,900	6,000	8,400	1,500
15	7,000

¹Does not include branches of the building drain.²Not over two water closets.³Not over six water closets.

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connected thereto except that a 4 x 3 W.C. connection shall not be considered as a reduction in pipe size.

1305.5 Minimum Size of Stack-Vent or Vent Stack.

Any structure to which a building drain is installed shall have at least one stack-vent or vent stack carried through the roof, size to be determined by Table 1305.3 and 1421.5, but not less than 3 inches diameter permitted.

1305.6 Future Fixtures.

When provision is made for the future installation of fixtures, those provided for shall be considered in determining the required sizes of drain pipes. Construction to provide for such future installation shall be terminated with a plugged fitting or fittings at the stack so as to form no dead end.

1305.7 Underground Drainage Piping.

No portion of the drainage system installed underground or below a basement or cellar shall be less than 2-inches in diameter.

1306 Offsets on Drainage Piping.

1306.1 Offsets of 45 Deg. or Less. (Five Stories or More)

An offset in a vertical stack, with a change of direction of 45 deg. or less from the vertical, may be sized as a straight vertical stack. In case a horizontal branch connects to the stack within 2-feet above or below the offset, a relief vent shall be installed in accordance with paragraph 1418.3.

1306.2 Waste Stacks Serving Kitchen Sinks.

In a one or two family dwelling only in which the waste stack or vent receives the discharge of a kitchen type sink and also serves as a vent for fixtures connected to the horizontal portion of the branch served by the waste stack, the minimum size of the waste stack up to the highest sink branch connection shall be 2-inches in diameter. Above that point the size of the stack shall be governed by the total number of fixture units vented by the stack.

1306.3 Above Highest Branch. (Five Stories or More)

An offset above the highest horizontal branch is an offset in the stack-vent and shall be considered only as it affects the developed length of the vent.

1306.4 Below Lowest Branch. (Five Stories or More)

In the case of an offset in a soil or waste stack below the lowest horizontal branch, no change in diameter of the stack because of the offset shall be required if it is made at an angle of not greater than 45 deg. If such an offset is made at an angle greater than 45 deg., the required diameter of the offset and the stack below it shall be determined as for a building drain. (Table 1305.2.)

1306.5 Offsets of More Than 45 Deg. (5 Stories or More)

A stack with an offset of more than 45 deg. from the vertical shall be sized as follows:

The portion of the stack above the offset shall be sized as for a regular stack based on the total number of fixture units above the offset.

The offset shall be sized as for a building drain. (Table 1305.2, Column 5.)

The portion of the stack below the offset shall be sized as for the offset or based on the total number of fixture units on the entire stack, whichever is the larger. (See Table 1305.3, Column 4.)

A relief vent for the offset shall be installed as provided in Chapter 14 and in no case shall the horizontal branch connect to the stack with 2-feet above or below the offset.

1307 Sumps and Ejectors.

1307.1 Building Drains Below Sewer.

Building drains which cannot be discharged to the sewer by gravity flow shall be discharged into a tightly covered and vented sump from which the liquid shall be lifted and discharged into the building gravity drainage system by automatic pumping equipment or by any equally efficient method approved by the Plumbing Official.

The design layout for pumped sewers shall include a check valve near the pump. At the high point of the grade, if the pumped sewer does not discharge into a manhole, it shall be provided with a vent at this point. Cleanouts may be installed if required by the local authority, at spaces required by the local authority.

The piping material selected shall withstand the design head of the pump. Depth shall provide for 18" minimum cover with a minimum depth cover of 24" where vehicle traffic may pass over it.

1307.2 Storage Period.

The storage of drainage in a sump or ejector shall not exceed a period of 12 hours.

1307.3 Design.

Sump and pumping equipment shall be so designed as to discharge all contents accumulated in the sump during the cycle of emptying operation.

1307.4 Venting.

The system of drainage piping below the sewer level shall be installed and vented, in a manner similar to that of the gravity system.

1307.5 Duplex Equipment.

Sumps receiving the discharge of more than six water closets shall be provided with duplex pumping equipment.

1307.6 Vent Sizes.

Building sump vents shall be sized in accordance with Table 1421.5 but shall in no case be sized less than 1½-inches.

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1307.7 Separate Vents.

Vents from pneumatic ejectors or similar equipment shall be carried separately to the open air as a vent terminal.

1307.8 Connections.

No direct connection of a steam exhaust, blowoff, or drip pipe shall be made with the building drainage system. Waste water when discharged into the building drainage system shall be at a temperature not higher than 140 F. When higher temperature exists, proper cooling methods shall be provided.

1308 Floor Drains.

1308.1 Accessibility.

Floor drains shall connect into a trap so constructed that it can be readily cleaned and of a size to serve efficiently the purpose for which it is intended. The drain inlet shall be so located that it is, at all times, in full view.

1308.2 Connection.

Floor drains subject to backflow shall not be directly connected to the drainage system, or shall be provided with a backwater valve.

1308.3 Provision for Evaporation.

Floor-drain trap seals subject to evaporation shall be of the deep-seal type of not less than 4-inch water seal, or shall be fed from an approved plumbing fixture or by means of an approved automatic priming device designed and approved for that purpose.

1308.4 Venting.

Floor drains need not be individually vented when sized according to Par. 1422.2.

1308.5 Size.

Floor-drain traps and drains, installed below a basement floor or underground, shall be not less than 2-inches in diameter.

1308.6 Bell Traps.

Bell traps shall not be permitted.

1310—Solvent Plumbing Systems

Single stack solvent plumbing systems may be used upon the request of an owner or owning agency and the system is designed and inspected by a Professional Engineer registered in the State of North Carolina.

CHAPTER XIV

VENTS AND VENTING

1401 Materials.

1401.1 Vents.

Pipe, tubing, and fittings for the vent piping system shall comply with the provisions in Chapter V.

1401.2 Specific Type.

Standards given in Table 505 apply to the specific materials approved for use and as indicated in the various paragraphs in this chapter as they apply to the venting system.

1401.3 Piping Above Ground.

Vent piping shall be cast iron, galvanized steel, galvanized wrought iron, lead, brass or copper pipe, copper tube, stainless steel tube or Schedule 40 ABS, ABS Foam Core or PVC DWV, as allowed in Section 504.2.

1401.4 Piping Underground.

Vent piping placed underground shall be cast iron, copper tube of a weight no less than that of copper water tube Type L, Grade H stainless steel water tube or Schedule 40 ABS, ABS Foam Core or PVC DWV as allowed in Section 504.2, provided that other materials may be used for underground vents when found adequate and installed as directed by the plumbing official. Where threaded joints are approved for use underground, they shall be coated and wrapped after installation and tests.

1401.5 Fittings.

Fittings shall conform to the type of pipe used in the vent system as required by paragraph 1401.2 and 1401.3. Black drainage and galvanized malleable fittings may be used on drainage, waste and vent with galvanized pipe. Copper or cast copper alloy fittings shall be used with stainless steel tube.

1401.6 Acid System.

Vent piping on acid-waste systems shall conform to that required for acid-waste pipe, Section 1301.6.

1402 Protection of Trap Seals.

1402.1 Traps Protected.

The protection of trap seals from siphonage or back pressure shall be accomplished by the appropriate use of soil or waste stacks, vents, revents, back vents, loop vents, circuit or continuous vents, or combinations thereof, installed in accordance with the requirements of this chapter.

1403 Vent Stacks.

1403.1 Installation.

A vent stack or a main vent shall be installed with a soil or waste stack whenever back vents, relief vents, or other branch vents are required in two or more branch intervals.

Section 1403

1403.2 Terminal.

The vent stack shall terminate independently above the roof of the building or shall be connected with the extension of the soil or waste stack (stack-vent) at least 6-inches above the flood-level rim of the highest fixture.

1403.3 Main Stack.

Every building in which plumbing is installed shall have at least one main vent stack or stack vent, which shall run undiminished in size and as directly as possible, from the building drain through to the open air above the roof. Vent shall be sized according to Table 1421.5 and be not less than 3-inches in diameter.

1404 Vent Terminals.

1404.1 Roof Extension.

Extensions of vent pipes through a roof shall be terminated at least 6-inches above it except that where a roof is to be used for any purpose other than weather protection, the vent extensions shall be run at least 5-feet above the roof.

1404.2 Flashings.

Each vent terminal shall be made watertight with the roof by proper flashing.

1404.3 Flag Poling.

Vent terminals shall not be used for the purpose of flag poling, TV aerials, or similar purposes, except when the piping has been anchored to the construction and approved as safe by the Plumbing Official.

1404.4 Location of Vent Terminal.

No vent terminal from a drainage system shall be directly beneath any door, window, or other ventilating opening of the building or of an adjacent building nor shall any such vent terminal be within 10-feet horizontally of such an opening unless it is at least 2-feet above the top of such opening.

1404.5 Extensions Through Wall.

Vent terminals extending through a wall, when approved by the Plumbing Official, shall be at least 10-feet horizontally from any lot line. They shall be turned to provide an opening downward. They shall be effectively screened and shall meet the requirements of paragraph 1404.4. Vent terminals shall not terminate under the overhang of the building.

1405 Frost Closure.

1405.1 Vent Terminal.

Where there is a possibility of frost closure, the vent extension through a roof shall be at least 3-inches in diameter. When it is found necessary to increase the size of the vent terminal, the change in diameter shall be made inside the building.

1405.2 Increasers.

Change in diameter of vent terminals shall be made by use of a long increaser at least 1-foot below the roof.

1406 Vent Grades and Connections.**1406.1 Grade.**

All vent and branch-vent pipes shall be so graded and connected as to drip back to the soil or waste pipe by gravity.

1406.2 Vertical Rise.

Where vent pipes connect to a horizontal soil or waste pipe, the vent shall be taken off above the center line of the soil pipe, and the vent pipe shall rise vertically, or at an angle not more than 45 deg. from the vertical, to a point at least 6-inches above the flood-level rim of the fixture it is venting before offsetting horizontally or before connecting to the branch vent. Vents from floor drains and island fixtures, except kitchen sinks, are not required to extend above the flood level rim of the fixture.

1406.3 Height Above Fixtures.

A connection between a vent pipe and a vent stack or stack-vent shall be made at least 6-inches above the flood-level rim of the highest fixture served by the vent. Horizontal vent pipes forming branch vents, relief vents, or loop vents shall be at least 6-inches above the flood-level rim of the highest fixture served.

1406.4 Side-Inlet.

Side inlet closet bends are permitted only in cases where the fixture connecting thereto is vented and in no case shall the inlet be used to vent a bathroom group without being washed by a fixture.

1407 Bars and Soda Fountain Sinks.**1407.1 Bars and Fountain-Sink Traps.**

Traps serving sinks which are part of the equipment of bars, soda fountains, and counters need not be vented when the location and construction of such bars, soda fountains, and counters are such as to make it impossible to do so. When such conditions exist, such sinks shall discharge into a floor sink or hopper which is properly trapped and vented.

1407.2 Sumps.

Sinks or sumps, receiving indirect waste, shall be located in a properly lighted and ventilated space.

1408 Fixtures Back-to-Back.**1408.1 Distance.**

Two fixtures set back-to-back, within the distance allowed between a trap and its vent, may be served with one continuous soil or waste-vent pipe, provided that each fixture wastes separately into an approved double fitting having inlet openings at the same level. (See paragraph 1410.2.)

Section 1409

1409 Fixture Vents.

1409.1 Distance of Trap from Vent.

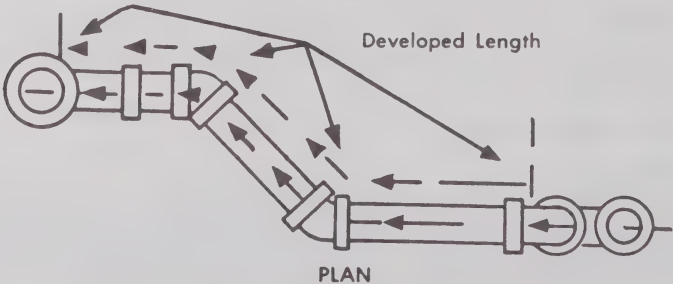
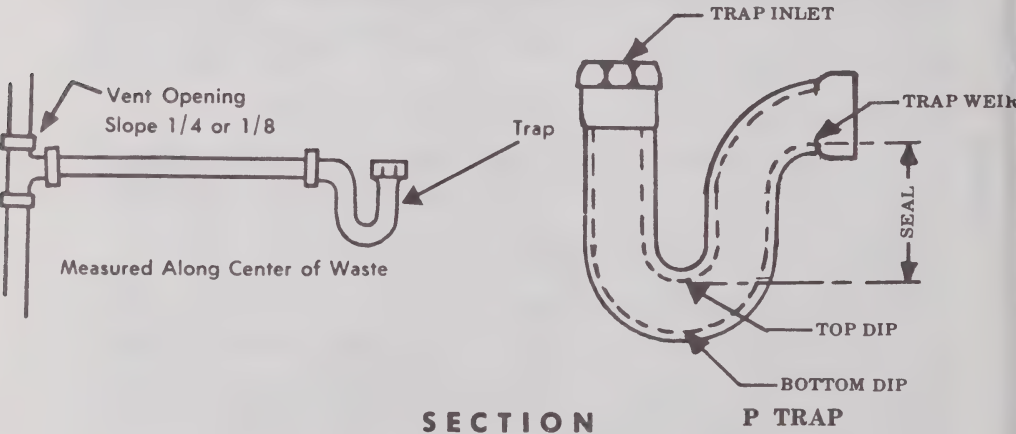
Each fixture trap shall have a protecting vent so located that the slope and the developed length in the fixture drain from the trap weir to the vent fitting are within the requirements set forth in Table 1409.3.

1409.2 Trap-Seal Protection.

The plumbing system shall be provided with a system of vent piping which will permit the admission or emission of air so that under normal and intended use the seal of any fixture trap shall not be subjected to a pressure differential of more than 1-inch of water.

TABLE 1409.3 — DISTANCE OF FIXTURE TRAP FROM VENT

Size of Fixture Drain Inches	Distance Trap to Vent
1¼	2 ft. 6 in.
1½	3 ft. 6 in.
2	5 ft. 0 in.
3	6 ft. 0 in.
4	10 ft. 0 in.



DEVELOPED LENGTH MEASUREMENT

CHAPTER XV

STORM DRAINS

1501 General.

1501.1 Drainage Required.

Roofs, paved areas, yards, courts, and courtyards, shall be drained into a storm-sewer system or a combined-sewer system where such systems are available.

1501.2 Prohibited Drainage.

Storm water shall not be drained into sewers intended for sewage only.

1501.3 Traps.

Leaders and storm drains, when connected to a combined sewer, shall be trapped.

1501.4 Expansion Joints.

Expansion joints or sleeves shall be provided where warranted by temperature variations or physical conditions.

1501.5 Subsoil Drains.

Where subsoil drains are placed under the cellar or basement floor or are used to surround the outer walls of a building, they shall be made of open-jointed or horizontally split or perforated clay tile, or perforated bituminized fiber pipe or asbestos cement pipe, or ABS or PVC plastic pipe, when allowed by Code, meeting the requirements of Table 505 may be accepted, not less than 4-inches in diameter. When the building is subject to back-water, the subsoil drain shall be protected by an accessibly located back-water valve. Subsoil drains may discharge into a properly trapped area drain or sump. Such sumps do not require vents.

1501.6 Building Subdrains.

Building subdrains located below the public sewer level shall discharge into a sump or receiving tank the contents of which shall be automatically lifted and discharged into the drainage system as required for building sumps.

1502 Materials.

Note: Interior storm drain systems which utilize plastic pipe must use Schedule 40 ABS, ABS Foam Core or PVC DWV pipe and fittings meeting the requirements of Table 505.

Exterior storm water, area drains, subsoil drainage and septic tank fields may use lighter sewer grade ABS, ABS Foam Core or PVC.

1502.1 Inside Conductors.

Conductors placed within a building or run in a vent or pipe shaft shall be of cast-iron, galvanized steel, galvanized wrought-iron, galvanized "ferrous alloys, brass, copper, lead, stainless steel tubing, or ABS, ABS Foam Core or PVC plastic pipe when allowed by code, meeting the requirements of Table 505 may be accepted.

Section 1502

1502.2 Outside Leaders.

When outside leaders are of sheet metal and connected with a building storm drain or storm sewer, they shall be connected to a cast-iron drain extending above the finish grade, or the sheet-metal leader shall be protected against injury.

1502.3 Underground Storm Drains.

Building storm drains underground, inside the building shall be of cast iron soil pipe, Type "L" copper water tube or ABS, ABS Foam Core or PVC DWV as required in Table 505.

1502.4 Building Storm Drains.

Building storm drains underground, inside the building, when not connected with a sanitary or combined sewer shall be of cast-iron soil pipe, Type "L" copper water tube or ferrous-alloy piping except that when approved by the Plumbing Authorities, vitrified-clay pipe, concrete pipe, ABS, ABS Foam Core or PVC plastic pipe, when allowed by Code, meeting the requirements of Table 505, bituminized-fiber pipe and asbestos-cement pipe, or stainless steel tube grade G may be used.

1502.5 Building Storm Sewers.

The building storm sewer shall be of cast-iron soil pipe, vitrified-clay pipe, concrete pipe, bituminized-fiber pipe, or asbestos-cement pipe ABS or PVC plastic pipe, when allowed by Code, meeting the requirements of Table 505.

1503 Traps.

1503.1 Main Trap.

Individual storm-water traps shall be installed on the storm-water drain branch serving each conductor, or a single trap shall be installed in the main storm drain just before its connection with the combined building sewer, main drain, or public sewer.

1503.2 Material.

Storm-water traps, when required, shall be of cast-iron.

1503.3

No traps shall be required for storm-water drains which are connected to a sewer carrying storm-water exclusively, except for floor drains.

1503.4

Traps for individual conductors shall be the same size as the horizontal drain to which they are connected.

1503.5

Conductor traps shall be so located that an accessible cleanout may be installed on the building side of the trap.

1504 Conductors and Connections.

1504.1

Conductor pipes shall not be used as soil, waste, or vent pipes, nor shall soil, waste, or vent pipes be used as conductors.

(c) Pipe shall be set firmly according to line and grade, and, preparatory to making pipe joints, all surfaces of the portion of the pipe to be jointed shall be cleaned and dried. The joints shall then be carefully adjusted and filled with the jointing material.

(d) Trenches shall be kept water-free during jointing for a sufficient period thereafter to allow the jointing material to become fully set and completely resistant to water penetration. Trenches shall be backfilled immediately after pipe is laid therein to prevent dislocation of the sewer line or jointing material. (Note: Not applicable when factory applied flexible compression joints are used.)

C. Testing.

(a) The sewer line will be tested as required elsewhere herein, or as prescribed by local authority.

DESIGN, ASSEMBLY AND INSTALLATION INSTRUCTIONS FOR POLYBUTYLENE (PB 2110) PIPE AND TUBING

1. Markings—Pipe, tubing, and fittings shall be permanently marked as follows:

A. Pipe and tubing at intervals not more than 5 feet.

(1) Manufacturers name or trademark.

(2) NSF-PW

(3) PB 2110

(4) 100 psi @ 180°

(5) Size

(6) ASTM-3309

(7) Production date

(8) SDR-11

B. Fittings

(1) Manufacturer's name or trademark.

(2) NSF-PW

2. Installation—Because of the greater rate of thermal expansion of PB over metal piping (1" per each 10° F temperature change for each 100 feet of pipe or tubing) allowance must be made for linear movement of the piping. When installing long runs check the amount of space available for linear movement of the line before making the final connection.

Pipe expansion allowance shall be provided by the use of offsets in the line. On vertical pipe risers between floors, an offset of twelve inches shall be provided midway between the floor and ceiling. Pipe or tubing shall not be rigidly anchored to supports. Pipe and tubing shall be supported at not more than 3 foot intervals. Supports shall not compress, distort, cut or abrade the piping. Strap hangers shall be a minimum of ¾ inches wide.

All piping system components shall be aligned to eliminate stress. Pipe shall not be bent or pulled into position after being assembled. Fittings

shall be used for all changes of direction when pipe is used. For tubing installations change of direction fittings shall be used except when a minimum bending radius ten times the tubing diameter can be provided.

When pipe is installed through studs or joists, use oversized holes. Care should be taken in designing the installation so that thermal expansion and contraction does not concentrate excessive stresses at the pipe fittings and joists. In general it is best to absorb stresses resulting from thermal expansion and contraction in the pipe rather than in fittings and joints. This can be done by allowing for unrestricted movement in the pipe adjacent to and up to 24" from all fittings. (NOTE: Sections 2501 (a) and (c) of Volume I states that no combustible materials shall enter into the construction of wall, floor and room assemblies unless such assemblies have been tested in accordance with ASTM E-119 where the code requires such assemblies to have an hourly fire resistance rating.)

Caution shall be taken to prevent kinking and buckling of the tubing and, in its location and/or use, to prevent mechanical damage to the tubing.

Although PB pipe and tubing resists nail penetration because of its resilience, the same precautions used for protecting metal pipe from nail penetration should be used.

Because this material is non-metallic, PB pipe eliminates galvanic action. However, where electrical systems are traditionally grounded to the cold water piping, some alternate means of grounding is required when PB piping is used.

Joints and connections shall be either of the spun weld type, flared insert type or pressure-lock (which includes an internal elastomeric seal and metal retainer clip) type fittings assembled in accordance with the manufacturer's assembly instructions.

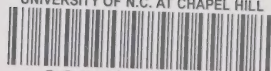
The tubing and pipe shall be cut clean and square, preferably using a tubing cutter with thin, finely-honed cutting wheel designed specifically for plastic.

Pipe and tubing shall not be threaded. Transitions from plastic to metal shall be done with a threaded adapter or other listed and applicable transition fitting.

Only listed thread tape (for example, Teflon) or listed plastic thread lubricant shall be used. Conventional pipe thread compounds, putty linseed oil base products and unknown mixtures shall not be used. Tighten threaded, plastic joints approximately ($\frac{1}{2}$) to (1) turn past handtight. (Note: "Handtight" refers to the number of threads to reach handtight with metal pipe.) As in the use of metal pipe, experience will dictate tightness required.

This material is not intended for use at temperatures above 180° F and; therefore, may not be suitable for use with instantaneous type coil or immersion water heaters. This material is suitable for use with storage type water heaters; however, a minimum of 6 inches of metal pipe shall be installed between the hot water outlet and the PB pipe or tubing. A minimum of six inches clearance shall be maintained between the flue of liquid fuel fired water heaters and the PB pipe and tubing.

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